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ABSTRACT

Curriculum units developed by high school teachers are provided for specific content instruction in energy education. Based on group agreement that energy education should assist students in changing attitudes, altering personal behavior and energy consumption, and developing sound alternatives, the units are categorized by social studies, science, and home economics. The social studies units begin with several activities involving energy vocabulary terms. For example, crossword puzzles and bingo games reinforce definitions. A week-long simulation game based on political decision making creates awareness of energy allocation problems in terms of such issues as litter clean-up, new housing developments, and public swimming pools. The science units focus on the technology of biological and physical energy systems. Debates about different types of energy use are encouraged, and laboratory projects such as the construction of a solar biogenerator are encouraged. In the home economics units, students learn methods of energy conservation in family life and personal values. Carefully planned house construction, insulation, and use of shrubbery are seen to reduce energy consumption in all seasons. Making hot pads out of a discarded quilt is one of several suggestions for recycling household materials. (AV)

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FINAL REPORT

Volume II

United States Energy Research and Development Administration
400 First Street, N.W.
Washington, D.C. 20545

IMPLEMENTING ENERGY EDUCATION IN FLORIDA'S HIGH SCHOOLS:

A Two-Week Credit Institute for Teachers in North Florida

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— SEPTEMBER 1976 —

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INTRODUCTION

Education in Florida's public schools is developing a national reputation for highly innovative and enlightened programs that uniquely respond to public interest. Schools in Florida reflect the values, norms and concerns of current society. The responsiveness of the Florida system is largely due to the highly skilled classroom teachers employed by the system and the flexibility of the curriculum.

Recent public awareness of environmental and other energy related problems led to the establishment of the Florida Office of Environmental Education within the Department of Education. This office is strategically located directly on the Commissioner of Education's staff and enjoys a unique prominence in state educational structures. The field staff of this office are in regular contact w with teachers and principals throughout the 67 school districts in Florida. Each district and each school within that district has a person responsible for implementing environmental education. This structure of field coordinator, district contact and school resource person provides the mechanism for implementing energy education programs in Florida.

The Environmental Education Project at Florida State University has worked closely with the Florida Office of Environmental Education to provide a series of inservice teacher training workshops throughout Florida. These workshops deal primarily with specific content areas such as beach ecology or specific implementation strategies such as developing valuing skills. Last year over 100 such workshops were conducted in Florida.

A frequent need expressed by teachers was for specific content instruction in the realm of energy education and ways to teach energy education in its broadest scope. Teachers expressed the desire for workshops that would open a new content area for them but within the subject matter they currently teach. Science teachers wanted to learn more about the technology of biological and physical energy systems; home economics teachers expressed interest in exploring the many dimensions of energy use and conservation in areas that relate to family life and personal values.

These energy units were developed by Florida teachers to help better understand energy, energy conservation, and lifestyles.

D.E.L.
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FOREWORD

On the first day of the Energy Education Institute the participants developed initial definitions of energy; set forth some reasons for doing energy education, and specified general goals for energy education. Those are offered below and may be contrasted with the energy education materials which the teacher-participants developed at the end of their experience.

WHAT IS ENERGY?

- Energy is the ability to do work; to make things move; to create change in ecosystems.
- Energy and matter are the fundamental elements of our universe. Energy is the force permitting transformation in states of matter.
- The participants were concerned about specifing kinds and sources of energy.

Kinds	Sources
Mechanical (Potential/Kinetic)	Solar/Fossil
Chemical	Geo-thermal
Electro-magnetic	Mechanical
Heat	Nuclear
Nuclear	

WHY ENERGY EDUCATION?

Energy may be thought of as a product. Like many products, the rate of consumption is about to exceed production, hence; problems are arising. People must know the ramifications of their actions. It is in the perspective that education must play a role--a force in consumer/citizen education.

- We are wasteful in our habits and lifestyles.
- The energy crisis is upon us with the reality of limited, traditional energy sources used by mankind.
- People in significant numbers refuse to recognize the reality of an energy crisis; finite fossil fuels, lifestyle expectations, increased population and demand per person.
- We need personal behaviors based upon the energy facts of life; in urban/industrial societies and in developing nations.
- We need the power of government (laws, plans, and policies) to deal with the energy facts of life in terms of production, consumption, price, equity of distribution, etc.
- We need to see the potential domestic and world political implications of future energy situations (competition, justice/equity, danger of sources, etc).
- We need to prepare ourselves and others for citizen participation in a democratic society where we work together on energy policies, concerned for our future together as humans in a world of humans.

WHAT ARE THE GOALS OF ENERGY EDUCATION? Energy Education should:

- Give participants useful information and reliable knowledge about energy sources, energy types, energy concepts, energy options, etc.
- Assist participants to change attitudes and alter personal behavior where they feel it is necessary or desirable. This includes offering education directed to ethical awareness, energy conservation, and citizenship skills.

--Assist participants to know how to alter energy consumption and how to participate effectively on energy policy issues in civic life.

--Assist participants in developing alternatives which are safe, environmentally sound and just. Alternative lifestyles, social policies and human behaviors are as important as alternative sources of energy.

I CONCEPTS IN ENERGY

I. Concepts in Energy*

A. The Universe of Energy

1. Energy is the ability to do work.
2. Energy exists in many different forms, including light energy, electrical energy, chemical energy, mechanical energy and heat energy.
3. Changes in the motion or position of matter only occur when energy is exerted.
4. Almost all of the energy available on earth comes from the sun.
5. Solar energy comes in the form of solar radiation of various wavelengths.
6. Work occurs when energy produces an observable change in the motion or position of matter.
7. Solar radiation is produced as a by-product of the sun's constant nuclear fusion.
8. Energy can be changed from one form to another.
9. Light can be considered as either a wave or a particle, depending upon the purpose of the observer.
10. Solar radiation, if considered as waves, can be classified according to the lengths of the waves.
11. Different forms of energy are able to do different amounts of work.
12. Kinetic energy refers to any form of energy that is actively doing work.
13. Potential energy refers to any form of energy that is inactive or stored.
14. The earth is an open system which constantly receives solar energy and which constantly gives off heat energy.
15. A machine changes energy from one form to another.
16. Life can exist on earth only because of the constant and steady arrival of solar energy and the equally steady loss of heat energy into outer space.
17. All matter contains potential energy.
18. Living organisms change energy from one form to another.
19. Energy can be changed from one form to another, but it can never be either created or destroyed.
20. Although energy is constantly changing from one form to another, the total amount of energy in the universe is always the same.
21. Whenever energy is changed from one form to another form, some of that energy becomes less organized and concentrated and hence less capable of doing work.
22. The energy output of a machine can never exceed the amount of energy that was put into it in the first place.
23. Some energy can be made more organized and concentrated, but when this is done, some other energy will be made less organized and less useful in the process.

B. Living Systems and Energy

1. All living organisms require energy to maintain such characteristic functions as movement, responsiveness, growth, reproduction and metabolism.
2. Solar radiation is the only ultimate source of energy that any living organism can use to power its vital function.

3. Only green plants are the only form of life that can capture the energy available in solar radiation. They do it by means of photosynthesis.
4. Plants that can capture solar energy are called producers.
5. During photosynthesis, plants change solar energy into chemical energy. This chemical energy is stored in complex chemical molecules.
6. When plants store energy in complex chemical molecules, they create new plant issue.
7. Organisms which can't capture solar energy themselves must get the energy they need by eating the tissue of green plants, or by eating the tissue of other organisms that have themselves eaten green plants.
8. Organisms that eat the living tissue of producers are called consumers.
9. An organisms uses most of the energy it gets to maintain its vital functions. It stores any excess energy in tissue.
10. Organisms release the energy they store in complex chemical molecules by means of a chemical process called respiration.
11. Organisms that eat the dead tissue of either producers or consumers are called decomposers.
12. Ultimately, any solar energy captured by producers is either released into the atmosphere as heat during respiration, or is stored in the organism's tissue and is available for future use as chemical energy.
13. Living organisms store energy as chemical energy in their tissue.
14. Feeding relationships between producers, consumers, and decomposers form patterns called "food chains" or "food webs" that describe the paths by which energy is transferred from one organism to another.
15. Even after an organism dies, its stored chemical energy is still available in its tissues and can be obtained and used by other living organisms.
16. The overall pattern formed by the movement of energy from producers to consumers is a complex food web called an energy pyramid.
17. Energy stored in the tissue of dead organisms, if it remains in the earth under pressure for a long time, becomes a fossil fuel such as coal, oil, or natural gas.
18. Trophic level refers to the number of energy transfers an organism is away from producers which occupy the first trophic level.
19. About ninety percent of the energy captured by an organism living on a given trophic level is used up in the respiration necessary to keep that organism alive.
20. An organism can occupy more than one trophic level.
21. Some non-energy chemical substances that are stored in living tissue become concentrated as they pass upward through a food web.
22. Only about ten percent of the energy captured by an organism on one trophic level can be captured by a consumer or a decomposer on the next higher trophic level.
23. An organism on a higher trophic level has less energy available to it than organisms on lower trophic levels.
24. As energy flows through a system, it imposes order on that system.
24. A living system is a pattern of matter that uses energy to maintain its organization.

C. Energy and Human Use

1. All human beings must consume energy to stay alive.
2. Human beings transform and manipulate energy sources to satisfy their needs and wants.
3. External energy is energy that is used by an organism to change the environment outside its body.
4. Human beings use external energy to decrease adverse environmental conditions, to power machines, and to maintain their culture.
5. Human beings are among the very few organisms that use large quantities of external energy.
6. Internal energy is energy that is used to maintain an organism's bodily functions. Human beings obtain internal energy from the food they eat.
7. Human beings have steadily increased their consumption of external energy throughout history.
8. Human beings living in technological cultures have greatly increased their consumption of external energy in the last few hundred years.
9. The sources of external energy have changed as new sources have been found and as old sources have been depleted or found to be less desirable.
10. In the course of human history, the major sources of external energy have changed from renewable ones such as plants and animals to depletable ones such as coal, oil and natural gas.
11. Human beings obtain food from many different sources and thus they occupy more than one trophic level.
12. Human beings use external energy to create and sustain special ecosystems such as cities, recreation areas, and agricultural areas, at the expense of natural ecosystems.
13. Human beings have used external energy to increase agricultural yields and thus increase the amount of food and internal energy available to them.

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*Modified from a scheme produced by the John Muir Institute for Environmental Studies.

II SOCIAL STUDIES UNITS

Energy Vocabulary Terms And Alternatives - A Beginning

A. Introduction: How these activities might be used: These introductory activities help students examine energy from a personal and scientific view.

B. Objective: To help create an awareness of some energy terms used in today's society.

C. Activities:
   1. Have the students do the "Personal Preference Choice."
   2. Have the students research newspapers and magazines for their Energy definitions. They should identify the source used to get their definitions.
   3. After the completion of activities #1 and #2, have the students discuss their "Personal Preference Choices" and Energy terms in class.

D. More Activities:
   1. Have students cut-out Energy terms and illustrations from discarded newspapers and magazines to make a collage or a bulletin board.
   2. Have the students do reports on Energy terms as they relate to daily living.

Activity I: Personal Preference Indicator

Which of the following would you prefer:

a.	a regular toothbrush	or	an electric toothbrush
b.	a regular comb	or	an electric comb
c.	riding a bicycle	or	driving a car
d.	driving a car	or	taking a bus
e.	using a safety razor	or	using an electric razor
f.	using a fan	or	using an air conditioner
g.	fuel oil heat	or	electric heat
h.	a Ford Pinto	or	a Lincoln Mark IV
i.	taking a train	or	flying in a jet

1. Why do you prefer one alternative over the other?
2. How do your choices reflect our American life-style?
3. Do you think your choices are the "right" choice? Why? Why not?

Activity II: Energy Terms

Use newspapers and magazines to research for energy definitions

1. Atomic
2. Bioenergetics
3. Breeder Reactors
4. B. T. U.
5. Chemical Energy
6. Coniferous
7. Deciduous
8. Distillation
9. Ecology
10. Electricity
11. Energy
12. Energy (2)
13. Environment
14. Fission Process
15. Fossil Fuel
16. Gas
17. Generator
18. Gravity
19. Green House
20. Hydro-electrical
21. Inorganic
22. Kinetic Energy
23. Mechanical Energy
24. Nuclear Power
25. Oil
26. Organic
27. Petroleum
28. Plant
29. Potential Energy
30. Power
31. Protons
32. Radioactive
33. Rainfall
34. Recycle
35. Temperature
36. Thermal
37. Thermometer
38. Utility
39. Water Cycle
40. Wood

Learning The Language of Energy

NEWS WORDS

The following words are the difficult or technical ones which are essential to understanding and discussing the energy/ecology debate found in the selection, Pollute or Die? ENERGY MAKES THE WORLD GO ROUND. These defined words are set in the body of the selection.

1. energy-power - the force which makes things happen.
2. agriculture - farming.
3. agricultural - of or for farming.
4. environment - all of the things around us which have an effect on us.
5. environmental - of or about the environment
6. environmentalist - a person who is worried about protecting the environment.
7. prosperity - a comfortable way of life. wealth; success.
8. population - all of the persons or things in a certain place.
9. nuclear - having to do with the center or nucleus of an atom.
10. pollution - the act of making something dirty or not pure.
11. advocate - a person who argues in favor of something.

Pollute or Die? ENERGY MAKES THE WORLD GO ROUND

In the words of an old song, "Love Makes the World Go Round". In truth, it takes much more than love to make the world tick. It also takes a huge amount of ENERGY.

We use ENERGY whenever our hearts beat, our lungs breathe and our eyes see. We get this ENERGY from the food we eat. In fact, a farm is really an ENERGY changing machine. It traps sunlight and changes it into corn, wheat and rice.

There are four million people now living on Earth. In the year 2000, there will be more than seven million. Many people doubt that we will be able to grow enough food to feed all these people. AGRICULTURAL experts think we can - but we may wreck our ENVIRONMENT in trying to do so.

More food means more AGRICULTURAL chemicals. It also means more dams to provide water for AGRICULTURE. These are the very things that damage the ENVIRONMENT.

But that's not all. Man first started using machines to increase his PROSPERITY in the late 18th Century. Ever since then, he has had to worry about feeding his millions of machines. The world's POPULATION of ENERGY hungry machines has been growing faster than the human POPULATION. In addition, today's machines need much more energy than those of the past.

We have been digging coal out of the ground for about 700 years. We have burned half of all the coal that has ever been mined in the last 32 years. We have been pumping oil out of the ground for about 120 years. We have burned one half of all the oil that has ever been pumped in the last 14 years.

We are now told that we have an energy problem. Will we have enough coal, oil, natural gas and NUCLEAR fuels to feed our increasing number of machines? Experts do not think that we will run out of fuels - but we may wreck our ENVIRONMENT in getting them. Increased use of machines also means more garbage in our air and water. It means more waste heat to be gotten rid of. It means more NUCLEAR wastes to be stored somewhere. Again, these are the things that can ruin our ENVIRONMENT.

We need ENERGY to live - but the more we use, the more POLLUTION we have. ENERGY ADVOCATES say: no increase in ENERGY, no PROSPERITY. The ENVIRONMENTALISTS answer: the more ENERGY, the more ENVIRONMENTAL damage!

This difficult problem is the cause of today's fight between ENERGY ADVOCATES and ENVIRONMENTALISTS.

There are no simple answers to the question. It has many sides. We need ENERGY but we don't need POLLUTION. Yet, we can't have PROSPERITY unless we have ENERGY. What we have to do is decide how much ENERGY we really need. We must also learn how to make better use of the ENERGY we have. We must learn how to use more ENERGY with less pollution.

The answers can be found, but it will take time and a lot of work, because like love and marriage, ENERGY use and ENVIRONMENTAL damage together.

NEWS WORDS IN REVIEW

_______1. advocate

_______2. agriculture

_______3. energy

_______4. environment

_______5. nuclear

_______6. pollution

_______7. population

_______8. prosperity

A. farming

B. the force which makes things happen

C. having to do with the center of an atom

D. a person who argues in favor of something

E. all of the people in a certain place

F. a comfortable way of life

G. woods or other open space

H. the act of making something dirty

I. all the things around us

Answers: (1-D), (2-A), (3-B), (4-I), (5-C), (6-H), (7-E), (8-F)

FROM: ENERGY AND ECOLOGY

ENERGY WORDS - A PERPLEXING PUZZLE

This Word-Find Puzzle introduces you to some of the most important words used in the study of energy education. As you find the words on the left and right in the puzzle, circle them. They may be written vertically, horizotally, diagonally, or backwards.

1. energy
2. fossil
3. fuels
4. coal
5. natural
6. gas
7. crude
8. oil
9. heating
10. cooling
11. water
12. electricity
13. ocean
14. tide
15. fission
16. fusion
17. wave
18. transportation
19. manufacturing
20. solid

G A S O L I N E F H I G N
A A C K E R O S E N E S U
M T R B C D G H O M E U C
A O U E H E A T I N G N L
N M D F G L S O L I D H E
U S E S I E N E R G Y T A
F J K L F C W A T E R R R
A M M U N T A O P Q C A L
C O N S E R V A T I O N I
T N A O L I E S R S O S Q
U E B L S C O A L M L P U
R Y I A P I T V U S I O I
I U L R O T V E C C N R D
N W I X W Y L S F H G T F
G Y T Z E O O A O O B A I
T C Y D R I C E S O F T S
I G H T I L E J S L K I S
D R E C R E A T I O N O I
E P L M N O N P L Q R N O
U R A N I U M U V W X Y N
S T H Y D R O P O W E R T
E N V I R O N M E N T Z W
F U S S I O N N M L K J S

21. solid
22. uses
23. kerosene
24. gasoline
25. nuclear
26. power
27. atoms
28. uranium
29. solar
30. sun
31. hydropower
32. conservation
33. school
34. home
35. recreation
36. environment
37. money
38. saves
39. ability
40. petroleum

Sentence Completions

1. Most of the world today has an_______ _______. energy crisis, energy surplus.

2. Most cars and trucks use___________. gasoline, coal

3. Gasoline is made from_____________. natural gas, petroleum

4. Petroleum is the same as_______ _______. hard coal, crude oil

5. Most homes in Quincy are heated by _______ _______. heating oil, natural gas

6. When oil drillers find oil they usually find_______ _______. propane gas, natural gas

7. The United States has a good supply of _______. oil, coal

8. Most of our electricity is now made by burning_______. coal, wood

9. Many people are saving on heating fuel by burning_______. coal, wood

10. Much of our electricity in the future will probably be made from___________ energy. nuclear, gasoline

Energy Sayings

Each sentence describes some sort of movement (active or potential). Match the sentence with the phrase (A or B) that best describes the amount of energy being used.

_____1. That guy moves around all the time

_____2. I really don't feel like doing much today.

_____3. Gee, what a fast car!

_____4. I'm really sleepy today!

_____5. Wow! Look at that sailboat go!

_____6. That boat isn't even moving.

_____7. Hey! Did you see that guy pop a wheelie?

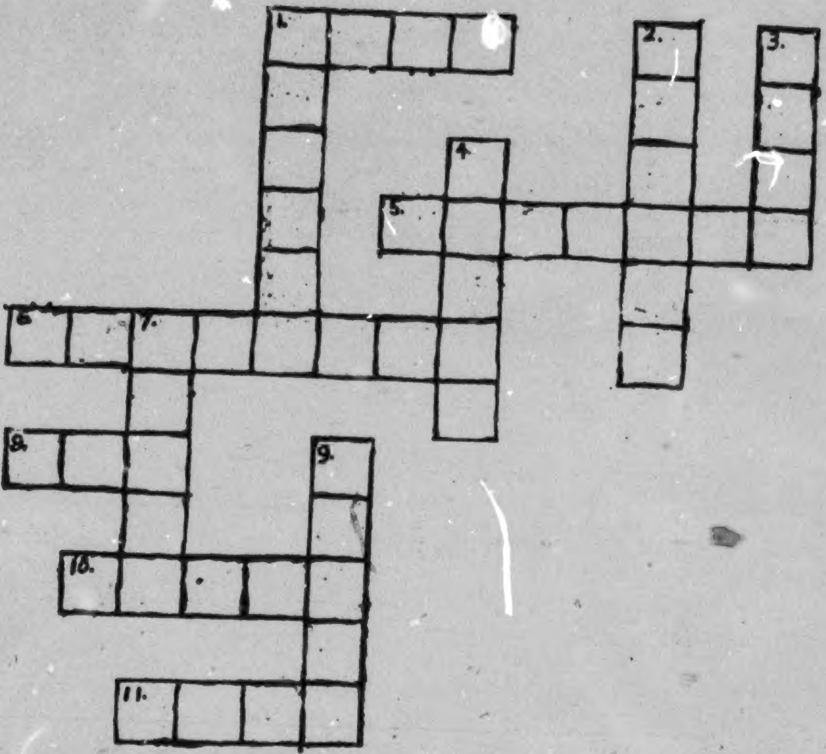
_____8. He really hustles when he plays ball.

_____9. I'm too tired to walk anymore.

_____10. That hot rod really has a big motor.

A. Lots of energy B. Not much energy

CROSSWORD PUZZLE



ACROSS:

1. You need_______to give your body energy.
5. ________gas can be pumped to your home for heating and cooking
6. Fuel for automobiles.
8. The first successful________well was drilled in the United States in 1859.
10. The thick liquid that is pumped from underground pools is called______oil.
11. Nuclear energy is energy released when an________is split apart.

DOWN:

1. Coal, natural gas, and oil are called_______fuels.
2. ________is the power to make things move.
3. The Europeans were the first to mine_______for heating.
4. In a steam engine, coal is burned to heat__________.
7. Energy from the sun.
9. When water boils, _________is released to work for us.

Source: Energy Activities with Energy Ant, page 17.

Message Puzzle -- Sources of Energy

Directions: Below are the definitions to words you will come across in your readings. Write the correct word in the spaces provided. Place the letter that fits in each circle in the circles at the bottom of this activity to determine the message. For students that have basic learning ability, many of these definitions should be shortened and a word bank of the answers included.

A. A black, combustible, mineral solid formed by the decompostion of vegetable matter away from air under high temperature and pressure over millions of years.

C○1 O○2 A L

B. Energy produced in the sun.

S○4 O L A R E N○3 E○5 R○6 G Y

C. Wastes that may be converted to energy directly by incineration or indirectly by biodegradation into methane.

W O O D A N D V○7 E○8 G E T A B L E

M A T T E R

D. Organic materials formed by the decay of the remains of prehistoric marine animals and plants.

O○9 I L

E. The splitting of the nuclei of atoms accompanied by conversion of part of the mass into energy.

N U○10 C L E A R○11 F I S S I O N

F. A form of solar energy that results from the earth's rotation and the heating of the atomsphere and earth's surface by the sun.

W I N D E N○12 E R G Y

G. Heat from the sun stored in substances such as rocks, water or air.

E N V I R O N M E N T A○13 L H E A T○14

H. Solar radiation which strikes an object after the radiation has been scattered and diverted by particles in the atmosphere.

D I F F $\underset{\bigcirc_{15}}{\text{U}}$ S E $\underset{\bigcirc_{16}}{\text{R}}$ $\underset{\bigcirc_{17}}{\text{A}}$ D I A T I O N

I. A mixture of gaseous hydrocarbons, chiefly methane, occurring naturally in the earth in certain places.

N A T U R A $\underset{\bigcirc_{18}}{\text{L}}$ G A S

J. Heat energy found beneath the earth's crust.

G E O T H E $\underset{\bigcirc_{19}}{\text{R}}$ M A L

K. Fuels such as coal, oil, and natural gas which are formed from the remains of plant or animal life of a previous geological period and are preserved in the earth's crust.

F O S S I L   F U $\underset{\bigcirc_{20}}{\text{E}}$ L $\underset{\bigcirc_{21}}{\text{S}}$

L. Energy which is captured by water wheels or turbines as water is falling.

H Y D R $\underset{\bigcirc_{22}}{\text{O}}$ E L E C T R I C   E N E R G Y

M. This form of energy utilizes the principle that heated air or water is less dense than cool air or water and therefore rises.

N A T $\underset{\bigcirc_{23}}{\text{U}}$ R A L   C I $\underset{\bigcirc_{24}}{\text{R}}$ $\underset{\bigcirc_{25}}{\text{C}}$ U L A T I O N

N. Partly decayed, moisture - absorbing plant matter found in bogs and swamps and used as a fuel.

P $\underset{\bigcirc_{26}}{\text{E}}$ A T $\underset{\bigcirc_{27}}{\text{S}}$

C	O	N	S	E	R	V	E	O	U	R	N	A	T	U	R	A	L	R	E	S	O	U	R	C	E	S
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

SUPPLEMENTARY ACTIVITIES IN ENERGY EDUCATION FOR THE SOCIAL STUDIES

A. Energy Awareness Activities

1. Day 1: Ask students to take 5 minutes and prepare a list of items they would like to buy. Prepare a master list showing each item's energy consumption value.

   Day 2: Give each student X amount of chips and a list of consumption rates. Explain that at the end of each 5 minute round he has to pay the energy collector for the energy his five items used during that round. Continue for five rounds of 5 minutes. The student who has the most chips remaining at the end of the game, WINS.

   Debriefing:

   --Can you draw any parallels to real life?

   --What is wrong with the situation?

   --What do you see as the purpose of the simulation?

2. Advertisement in *The New York Times*

   "Every 7½ seconds a new American is born. He is a disarming little thing, but he begins to scream loudly in a voice that can be heard for seventy years. He is screaming for 26,000 tons of water, 21,000 gallons of gasoline, 10,150 pounds of meat, 28,000 pounds of milk and cream, 9,000 pounds of wheat, and great storehouses of all other foods, drinks, and tobaccos. These are his lifetime demands of his country and its economy." To what degree are these "demand feedings" and to what degree are they "forced feedings." What are the implications?

3. Ask the class to list things they would buy if given an unlimited account. List these on board: (possible--planes, sports cars, big houses, T.V.'s, clothes, stero equipment).
   1. What would prevent you from enjoying all these things.
   2. Why did you choose these things?
   3. What element do most of them have in common?

   Discuss consequences of total energy depletion. This could be dramatized by cutting off air conditioner or heater, turning out lights, etc., (in newer schools).

   What are the possible consequences of your choices?

4. SITUATION: Due to an embargo and the lack of oil from domestic production, Florida has been allocated X amount of oil. This oil is under the control of the Florida Energy Board.

   METHOD: Have 5 students play the role of the energy board and divide the class into special interest groups such as: farmers, truckers, power companies, hospitals, fire and police, military, public transportation, each of whom demand part of the energy. Who gets it?

5. Illustrate in any way (drawing, poem, collage, narrative) how energy arrives at the lightswitch on your wall.

6. Group Activity

   Topic: Energy in Florida. Have groups write a list of questions. Have them choose five of the questions they have written and do research to find the answer.

   Example of questions;
   1. What are our sources of energy in Florida?
   2. Where do we get it?
   3. Are we running out?
   4. What alternatives do we have?

B. Energy and People

1. Attitudes Inventory
   1. Do you feel that we have an energy crisis?
   2. Why or why not?
   3. Do you personally do anything to conserve energy?
   4. If so, what?
   5. Do you encourage others to conserve energy?
   6. Why or why not?
   7. Do you think governmental restrictions should be imposed on the people in order to conserve energy?
   8. If so, what restrictions?
   9. How would you react to those restrictions?
   10. How do you feel that most Americans would react, if any at all, to those restrictions?
   11. Should there be severe punishment for violators of those restrictions?
   12. Which of the following age groups do you fall in?
       (a) under 18 (b) 18-25 (c) 26-35 (d) 36-45 (e) over 45
   13. Which of the following income brackets do you fall in?
       (a) $3,000-$6,000 (b) $7,000-$10,000 (c) $10,000-$20,000
       (d) over $20,000
2. The Newspaper - Propaganda Techniques

   Select two newspaper/magazine articles on energy sources, etc. Cite examples of propaganda techniques (name calling, glittering generalities, band wagon, testimonials, card stacking, transfer, and plain folks) being used.
3. Cause and Effect

   The statements in this exercise follow each other in cause and effect. Draw up four (4) statements of your own, using this same cause and effect relationship, but relate it to the energy crisis (i.e., how man's use of our resources in the name of "progress" has led to their depletion).
   1. Nations desiring power (cause) needed to possess colonies (effect).
   2. Nations possessing colonies (cause) needed large armies (effect).
   3. Large armies and navies (cause) meant large military budgets (effect).
   4. Large military budgets (cause) meant (what effect can you insert here?).
4. Decision Making

   Assume that you must determine "the" energy alternative best suited for your state. Use the following procedure to arrive at your answer.
   1. Define the problem.
   2. Plan a method of investigating the problem.
   3. Gather and evaluate the information found.
   4. Decide and act on implementing your findings.
   5. Evaluate the decision made.
5. Interest/Pressure Groups

   Find an environmentalist group, lobbyist or interest group in your State Capitol. Answer the following:
   1. What are their goals?
   2. What techniques do they use to influence politicians/educate the people?
   3. How effective have they been in influencing legislation dealing with energy and/or the environment?

4. What energy alternative, if any, do they favor as a possible solution to the energy problem and why?

6. Energy Conservation

Assume that you are working for an advertisement firm and your task is to create four (4) slogans that relate to the conserving of energy. Design posters that relate to energy conservation.

C. Looking at Alternatives

1. Have students read the following quotation and then respond to the questions below.

Americans need "an ethic of national thrift"; it should include minicars; severe gas rationing, fewer airline flights, and--lay in the firewood--an end to central heating.... In 1972, the 6 percent of the planet's inhabitants who live in this country used nearly 40 percent of the total energy consumed in the entire world. Two hundred million Americans use about as much energy for air conditioning as the 800 million mainland Chinese use for all purposes..the era of "cheap power" is over; a new era of thrift must be inaugurated. I am convinced that we can combine conservation and technology to redefine progress--and produce lifestyles that will be leaner and more fulfilling. In the words of Gandhi, our slogan should be: "There can be enough for everybody's need, but not enough for everybody's greed."

Source: "The Energy Crisis: A Radical Solution" by Stewart L. Udall (World, May 8, 1973).

Which of the above statements are based on facts?

Which are reflective of values held by the author?

Do you agree with the authors' statements of value? State your reasons for agreeing or disagreeing with him.

2. Using the attached graphs showing oil and coal production and demand, have students draw inferences concerning what problems will arise in the future and propose solutions to those problems. Some probing questions that may aid in student responses could include:

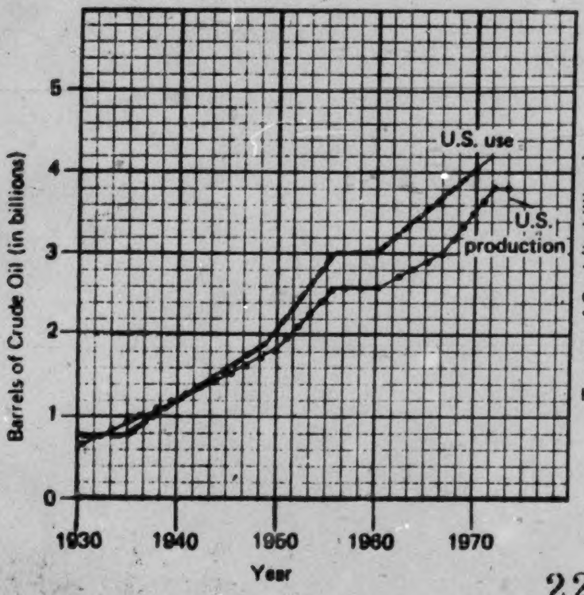
What has been happening to crude oil production?

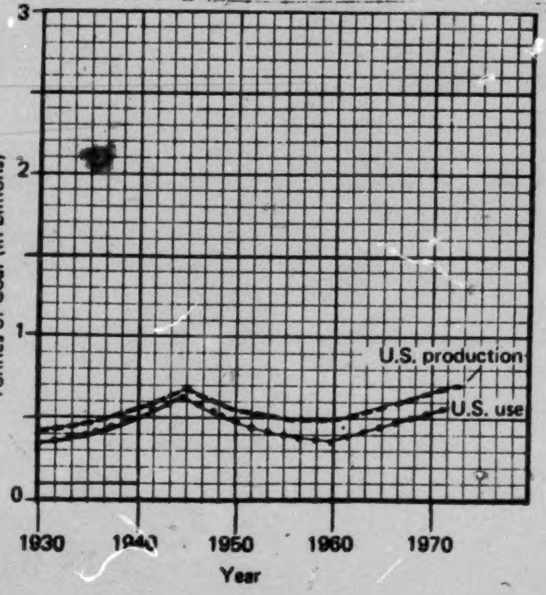
How is this related to use?

What consequences does this relationship suggest to you?

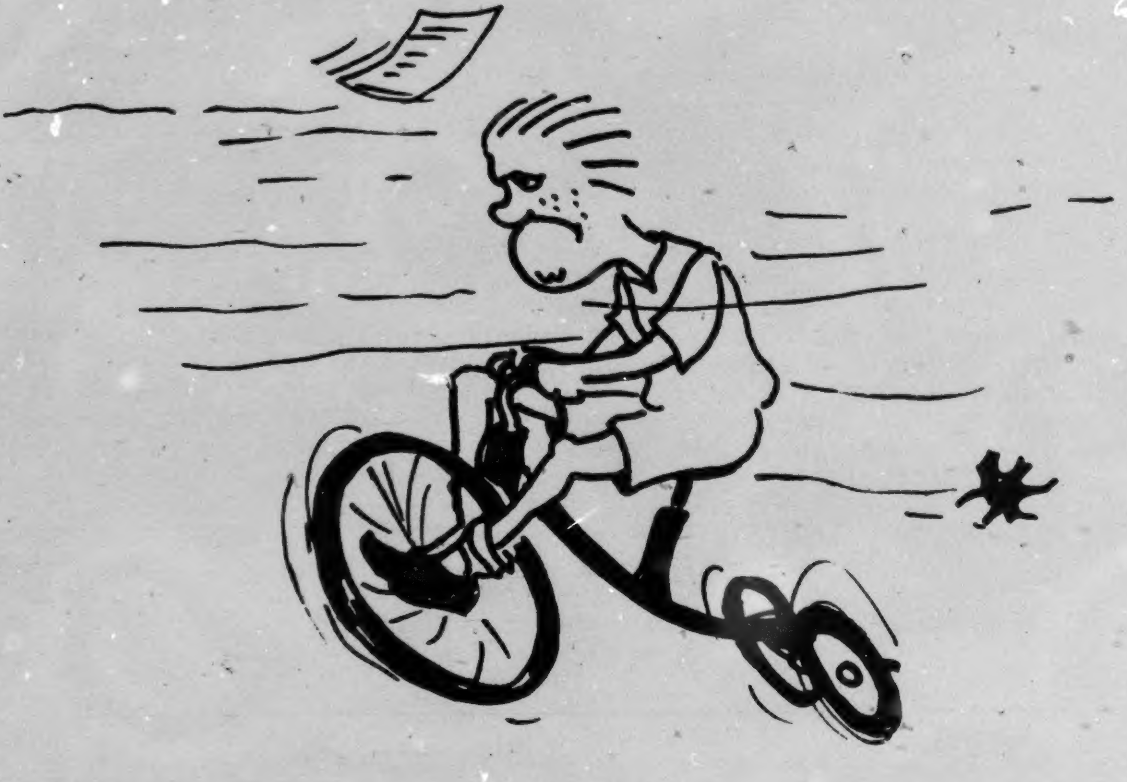
How do the figures for coal compare with those for oil?

Why do we not use more coal in the United States?





3. To explore the concept of the role of government in the energy crisis as well as personal responsibility, the following developmental questions may be helpful.
Who would ultimately decide which method of energy generation is the best?
How can they implement such a decision?
Why does the government have the power and/or the responsibility to decide how you are going to live?
What if you can afford to buy all the energy you want regardless of price? Should you do it? Why or why not?



23

ENERGY AND THE CONSUMER: Activities for Consumer Education

Introduction: As we begin America's third century, it is becoming increasingly apparent that bigger is not better; that modern does not necessarily function better than old, and that progress in terms of more and more consumer goods creates an expensive artifical demand. These activities attempt to help students become aware that the "Gimme More and Make it Bigger and Better" philosophy of our throw-away society is costly - perhaps too costly in terms Americans consider necessary for "The Good Life" or to help them "Move on Up" the social-economic ladder.

The main objective of these activities is to help students become aware of the energy costs to produce modern goods and services and to suggest alternatives. Hopefully with increasing awareness will come changes in attitudes and behavior.

1. Consider the concept (write on chalk board) "USE IT UP, WEAR IT OUT, MAKE IT DO OR DO WITHOUT."
   Questions - Class Discussion
   When do you think this concept was practiced? Where? Why?
   Does this concept have any relevance for today's society? For you? If so, what? If not, why not? Prepare a list of values expressed by lifestyles in 1776 and 1976.
   Why are some people living this philosophy today?
   How are you or how can you implement this philosophy?
2. Assign students to look for newspaper articles and illustrations relating to energy and bring in at least one of each for an energy bulletin board.
3. What is energy - class discussion with suggestions written on board by recorder. Show magazine illustration of various forms of energy. Agree on definition. List types of energy and energy sources.
4. What is a problem? Do problem definition.
5. Have students do an energy conservation survey in class - discuss. Students give survey to parents, teachers and other adults. Compare results.
6. What is the energy problem/crisis in our world today? What caused it? Divide into buzz groups for 15 minutes. Report ideas to class.
7. Obtain and present films for background information on energy problem.
8. Give students energy facts packet composed of graphs, charts and fact sheets. Chart and graph reading skills would be utilized.
9. Discuss the net energy concept.
10. To emphasize how important energy is in daily living, have students write a brief summary of their previous day's activities listing all products and services that required energy. Help students identify "hidden" energy consumers such as clothing, carpets, draperies from synthetics; aerosol products; plastic toys, toothbrushes, pens; kitchen consumers such as refrigerator and toaster; melmac dishes, counter tops; and food produced with artificial (oil based) fertilizers, harvested with air conditioned machinery, transported by train or truck, packaged in plastic wrap.
11. What can the consumer do to reduce his consumption/cost of energy? Recorders list suggestions.
12. Teach students to read their electric meter and chart the daily readings for a month. Houw could they reduce the amount of energy consumed? Try it.
13. Teach students to determine gas mileage for their car or their parent's car. Chart miles per gallon for 1 month. Compare make, model, year of cars belonging to class members. Which cars showed the best gas mileage?

14. Divide into groups according to student interest. Have students design an energy efficient:
    a. personal transportation or mass transportation system
    b. home
    c. school
    d. community
    e. public building
    f. personal life style
15. The cost of packaging and obsolescence.
    A. Visit a drugstore, supermarket, department store
        1. Make a list of products that are over-packaged.
        2. List energy sources required to produce them.
        3. Find out from store-manager (if possible) the cost of packaging.
        4. Determine the cost of items without packaging.
        5. Determine if over-packaging is due to transportation requirements, production, sanitation, ease of display or other reasons.
        6. List 10 or more examples of "correctly" packaged goods.
    B. Compare the cost of no-deposit, no-return soft drinks with the cost of comparable size returnable bottles. Why do producers make and people buy "No-deposit no return?"
    C. Visit Burger Chef, Burger King, MacDonald's, etc.
        1. List packagings and wrappings used for food.
        2. Find out from the manager packaging costs.
        3. Design a more energy efficient food dissemination system.
16. Compare the cost of a yard of polyester fabric with the cost of a yard of 100% cotton fabric. Compare the comfort of polyester slacks or shirt with cotton. Which feels better on a hot day when you do not have air conditioning? Which one gets snags, pulls or pills more easily? Investigate the cost of manufacturing polyester. What raw materials are used? Compare cotton - what raw materials are used? Which uses a non-renewable resource?
17. Have students work in teams to investigate the uses of electricity in their homes or apartments. List all electricial appliances, heat pumps, furnace fans and count all light bulbs. Then each team rank appliance usage of electricity using electrical consumption chart (watts). Each team should rank these uses from most necessary to least necessary. What are the areas of agreement? Disagreement? What are the implications of this agreement or disagreement for a national energy conservation policy?
18. Discuss Consumerism. How can consumers influence energy efficient merchandising and service? Consider Local, State and Federal groups, legislative action, education, others. Write a model county ordinance designed to save energy in advertising "Why is my electric bill so high" - a role playing activity.

Background Information:

Giant Power Corporation serves an area of which TACO County is part. The County has been growing quite rapidly in the past few years. In addition to permanent residents moving into the area requesting electricity, many tourists spend the winter months residing as semi-permanent residents.

TACO County has been and still is basically a rural county with thoroughbred horse farming and ranching activities as major revenue source. It does have some light industry with the Chamber of Commerce working hard to make the county attractive to new industries.

Since the 1973 oil embargo electric rates have escalated dramatically. Many residents, therefore, found ways to cut back electric usage so that Giant Power Corporation did not sell as much electricity as it was anticipating. Because of this, according to Giant Power Corporation, it fears it will not be able to continue showing the 9% profit the Public Service Commission allows it.

Therefore, Giant Power Corporation has requested the Public Service Commission to:

1. raise the electrical rates for private homeowners.
2. lower rates for commercial usage.
3. increase the refundable private user deposit to $75 for new customers.
4. increase the reconnect fee to $60.
5. charge customers $50 to have their meter checked if no Giant Power Corporation meter error is found.

The role playing situation is to simulate the hearing that was held. The roles are:

1. Three Public Service Commission Members - Three students serve as members of the Public Service Commission. They select a chairman and conduct the hearing. They question individuals and ask for comments from interested parties. When the hearing is conplete they decide their recommendations and report back to class. The Public Service Commission members are elected in state-wide elections. It is their job to regulate the public utilities. However, major contributions to their campaigns are received from the various utilities they regulate.
2. President of Giant Power Corporation - The Giant Power Corporation is a monopoly regulated by Public Service Commission. Its main objective, although it is called a "public utility" is to show growth and profit to its stockholders. The president's objective is to maintain his $100,000 a year salary and keep his powerful position by making decisions that increase profits for Giant Power Corporation. To absorb losses caused by inflation or high crude oil prices is not an acceptable alternative. The Public Service Commission grants the Giant Power Corporation the right to a 9% profit. This the president aims to maintain.
3. President of the Chamber of Commerce - This person represents the business interest in TACO County. He is very interested in securing new industries for the county. He would be strongly against raising rates for business and industry even though that would make the burden of energy cost more equitable for all consumers. Chamber of Commerce members make sizeable contributions to Public Service Commission members' campaign treasuries.
4. Spokesperson for Consumer Groups - This individual representing several hundred people maintains that individuals should not be penalized for following Giant Power Corporation and governmental publicity to cut back on electrical usage by having their rates increased. His argument is that the heavy consumers - the commercial consumers - should pay a higher not a lower rate than private or individual consumers since they are using a greater percentage of the electricity in a time of energy shortage than are the private consumers.
5. Woman on Welfare - This person, divorced, mother of 6, has no income other than welfare and the money she receives from ironing she takes in. She has had her electricity turned off twice and is again unable to pay her bill.
6. Retired Couple living of fixed income of Social Security and a small pension. These people moved to TACO County ten years ago when prices were within their budget. They were very proud of their small but

modern all electric Gold Medallion home. They bring in receipts to the hearing to show how their bills have risen from $10 in February, 1965 to $110 February, 1975. They cannot afford 1,000% increases in utility bills when their income is fixed.

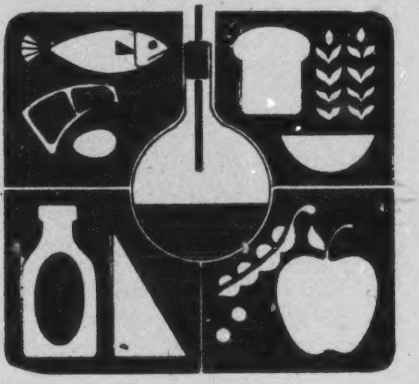
7. Representative of apartment owners who rent to winter tourists living in the county several months of the year. This person and these he represents argue that many semi-permanent winter residents will leave TACO County for other tourist - retirement areas because they cannot afford the increased utility rate, high deposit and high connect fee. He maintains that TACO County is a major tourist area, in fact, it was Florida's first, and that much money and many service jobs would be lost if the tourists left.

8. Widower living on $284 monthly Social Security - This person cannot now afford the base rate which amounts to $20 a month for his small one-bedroom house. He will have no choice but have his electricity disconnected if rates are raised any higher.

9. Teacher earning $9,000 per year. This person argues that the Giant Power Corporation should absorb some of the increasing costs of fuel and not pass all of the expense on to the consumer. He points out that he was not permitted a 9% profit, in fact he lost 10% in buying power last year because of no salary increase and inflation. After completion of role playing the issue and before the commission reports its decision to the class:
   a. Seek class consensus on the issue.
   b. How does spectator consensus compare with Commission's Consensus?
   c. What values were involved?
   d. What conflicts were apparent?
   e. What difficulties are there in making decisions/policies?
   f. What group, individuals or organizations have the most "power" in your opinion? Why?
   g. How can the private consumer affect decision-making?
   h. What was not realistic in this exercise?

SOURCES OF ENERGY/CONSUMER INFORMATION

Consumer Information Pueblo, Colorado	Ask for list of materials — many are available
Consumer Federation of America Office of Economic Opportunity Washington, D.C. 20506	Booklet: "Coping with the Energy Crisis"
Federal Energy Administration Washington, D.C. 20461	Federal Energy Fact Sheets & other energy materials
U.S. Department of Commerce National Bureau of Standards Washington, D.C. 20234	Energy and Environment pamphlets
Center for Science in the Public Interest 1779 Church Street, N.W. Washington, D.C. 20036	People and Energy Newsletters
Department of Agriculture and Consumer Services Division of Consumer Services Mayo Building Tallahassee, Florida 32304	Newsletter and packets



The Politics of Energy

OVERVIEW:

This activity creates awareness of the problems with the allocation of energy. The activity develops this awareness in a realistic manner. Allocation problems are basically political problems. Authoritarian decisions are, for the most part, decided in favor of those groups that can produce the most political pressure. This activity is organized around a simulation-game based on this description of political decision-making.

HISTORICAL FOUNDATION:

The description cited above is based on an elites model of politics. That is, political decisions are made for and by the elites of society. This is basically true because elites control the limited supply of political resources. For the purposes of this simulation, it is assumed that this is a realistic explanation of the political world.

PROBLEM AND OBJECTIVES:

The activity attempts to have students become aware of a dynamic process that has an effect on political decisions. The energy supplies, essential to carry on the day to day life of any community, will be drastically limited. The authoritative decisions made by governmental agencies will have profound impact on community life. To present complex developments (energy supplies and political conflict resolutions) in a relevant manner, a simulation-game was developed. The activity is organized around the following objectives: The student will

1. conceptualize the idea of power;
2. recall the basic projected levels of energy supplies in the year 2000;
3. formulate logical (in relation to the simulation) conclusions on how public policy is formulated;
4. formulate value positions on
    a. how public policy is decided;
    b. which type of issues are likely to be favorably treated by governments;
    c. the function of mass media on the political decision making process.

METHODS:

Day 1;

1. Begin the activity with a general overview of what the students will be doing for the next five days. The following points should be discussed:
    a. the students are going to examine the dwindling energy resources in the United States;
    b. The students will engage in a simulation-game that has them assume decision making roles in the year 2001. The roles will try to decide how energy is distributed in a small community;
    c. and the students will engage in discussion activity that determines what they learned from the game and how they feel about it.
2. The teacher comments that the United States is faced with a drastic energy crisis. Students will be shown a film that demonstrates this situation and how it will be in the year 2000. The teacher then lists the ways students use energy everyday; for important things; for fun things.
3. Teacher writes the following questions on the board and tells students these will be discussed after viewing the film:

   a. what is happening to the energy supplies?
   b. what seems to be causing the changes in energy supplies?
   c. how do you suppose this changing situation might affect your way of living when you become an adult?
4. Show the film (several are available; check with your media center).
5. Discuss the questions on the board.
6. Explain that decisions about energy will become more important. Government will become more involved in making such decisions.
7. Leads a discussion about how students will feel when the government decides how they will use energy.
8. Teacher points out a useful idea in thinking about this issue to power. Teacher tells students that they are going to play a game that looks at how citizen power will determine who will get to use the energy available.
9. Homework assignment: There are 5 kinds of social power; coercive, reward, legitimacy, expert and referrent. Have students look up these words and describe 3 situations where they used different kinds of power.

Day 2;

10. Review the homework assignment and ask students to contribute the answers to the following questions:
    a. what is (social) power?
    b. what are the different types of power?
    c. describe the different types of power.
11. Begin the simulation game by choosing five members of the class to make up a city council. Have them sit in a panel in the front of the class.
12. Announce that the panel represents a city council in the year 2001. The energy supplies are very limited. In the year 2001, the class assumes that every community is given a certain amount of energy. In this simulation, the community starts with 2 million equivalent barrels of oil energy.
13. The teacher might demonstrate one round of the simulation. Hands out the role descriptions. Ask each student to read the role description they received. Students are informed that the city council (who also have roles) will be making decisions that will affect the student roles. With the roles the students receive power bills that represent the amount of power each citizen has in the community.
14. Hands out the five issues for round one of the game. All issues must be decided yes or no. The way the issue is decided will either increase or decrease the power amount of each student. Each yes decision will also reduce the total community supply of energy.
15. Allow the class to read and study the first five issues. (5 minutes)
16. Each council member votes by lifting either the yes or no card in front of them for each issue. Majority on the council wins.
17. Students should compare their role card for the code number and the issue description for the corresponding code number. On the issue description, the student is instructed how many power bills the student wins or loses as a result of the council vote. The student either adds or subtracts the appropriate number of bills according to the vote. Members of council also may win bills with a favorable vote on issues that affect them.
18. The teacher disperses and collects all winning and losing bills. Students can be trusted to hand in and collect the appropriate amount.

Day 3, 4, 5:

19. Ask the students if they are pleased with the way the council voted. If not,

they will be able to elect three new members. Before the election, it will be useful to know what issues the next council will be voting on. Hand out the new set of five issues. The students should read and debate the issues.

20. Announces that it is time to elect a new council. To be a candidate for council, a citizen must give 50 power bills to announce his candidacy. Announcements are limited to 15 seconds and the first six students to buy "TV time" are allowed to be candidates. Students can get other students to donate bills in order to buy them.
21. When the six candidates are determined, they can make their 15 second speach. Additional time can be purchased for 50 power bills for 5 seconds. The teacher makes sure candidates only speak for the time purchased.
22. After each candidate speaks the class votes for a new council. The students getting the three highest number of votes win the seats. (Elections will proceed with 3 seats up for election, then 2 seats for election, then 3 and so on. Each campaign will allow 2 candidates per seat under contention.)
23. The new council votes on the five issues.
24. The teacher then follows the following sequence:
    a. subtract from the community's energy supply according to issues passed;
    b. addition and subtraction of bills;
    c. collection and dispersal of bills;
    dispersal of new issues;
    e. buy "TV time;"
    f. use "TV time;"
    g. vote for council members;
    h. council vote.

    This sequence can go for 30 issues (6 rounds). The teacher may stop the activity after any sequence. If the community runs out of energy, everybody loses. If not, the student with the most power bills wins. A student who runs out "dies" and loses the game.

Day 6;

25. Teacher conducts a discussion session. The following questions are suggested:
    a. After showing the students a list of issues that passed; What type of issues tended to win?
    b. Did you have any complaints about how the council decided? Explain.
    c. Who seemed to have advantages in getting their way?
    d. What role did the TV play? Do you think it was fair? Explain.
    e. What did those who were disadvantaged have to do to win a favorable council vote?
26. Assign short essays related to the objectives. Use the essays to evaluate the simulation and student progress.

ROLE

1. Role: Banker
Code Number: 1
Beginning amount of power: 2000

2. Role: College Professor
Code Number: 2
Beginning amount of power: 1000

3. Role: Head of a Population Control Council
Code Number: 3
Beginning amount of power: 700

4. Role: Mechanic
Code Number: 4
Beginning amount of power: 300

5. Role: Chamber of Commerce Member
Code Number: 1
Beginning amount of power: 2000

6. Role: School Teacher
Code Number: 2
Beginning amount of power: 300

7. Role: Head of Women for Population Control
Code Number: 3
Beginning amount of power: 700

8. Role: Carpenter
Code Number: 4
Beginning amount of power: 300

9. Role: Labor Union Head
Code Number: 4
Beginning amount of power: 700

10. Role: Environmentalist
Code Number: 4
Beginning amount of power: 300

11. Role: Telephone Worker
Code Number: 4
Beginning amount of power: 300

12. Role: President of a Local Corporation
Code Number: 1
Beginning amount of power: 2000

13. Role: Concerned Senior Citizen
Code Number: 3
Beginning amount of power: 300

14. Role: Plumber
Code Number: 4
Beginning amount of power: 300

15. Role: Student
Code Number: 3
Beginning amount of power: 300

16. Role: Electricians
Code Number: 4
Beginning amount of power: 300

17. Role: Housewife
Code Number: 3
Beginning amount of power: 300

18. Role: Housewife
Code Number: 4
Beginning amount of power: 300

19. Role: Construction Worker
Code Number: 4
Beginning amount of power: 300

20. Role: Farmer
Code Number: 4
Beginning amount of power: 300

ROLE

21. Role: Mechanic
Code Number: 4
Beginning amount of power: 300

22. Role: Carpenter
Code Number: 4
Beginning amount of power: 300

23. Role: Telephone Worker
Code Number: 4
Beginning amount of power: 300

24. Role: Plumber
Code Number: 4
Beginning amount of power: 300

25. Role: Teacher
Code Number: 4
Beginning amount of power: 300

26. Role: Teacher
Code Number: 4
Beginning amount of power: 300

27. Role: Gardener
Code Number: 4
Beginning amount of power: 300

28. Role: Painter
Code Number: 4
Beginning amount of power: 300

29. Role: Sales Person
Code Number: 4
Beginning amount of power: 300

30. Role: Consumer Lobbyist
Code Number: 3
Beginning amount of power: 700

Energy
Conservation
Now

ISSUE DESCRIPTION #1: Proposal to extend facilities so that it can be used as a community recreation center.

Amount of Energy: 100,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 30 bills	Code #1 loses 50 bills
Code #2 gains 100 bills	Code #2 gains 150 bills
Code #3 loses 25 bills	Code #3 gains 10 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #2: Proposal to build a new 200 unit apartment complex.

Amount of Energy: 150,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 150 bills	Code #1 loses 150 bills
Code #2 loses 25 bills	Code #2 gains 10 bills
Code #3 loses 75 bills	Code #3 gains 150 bills
Code #4 loses 10 bills	Code #4 gains 10 bills

ISSUE DESCRIPTION #3: Proposal to allow a karate school to be built and opened.

Amount of Energy: 150,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 10 bills	Code #1 loses 10 bills
Code #2 gains 25 bills	Code #2 loses 5 bills
Code #3 loses 25 bills	Code #3 gains 5 bills
Code #4 gains 10 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #4: Proposal to allow a Ford dealer to extend his inventory with 150 more cars.

Amount of Energy: 200,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 100 bills	Code #1 loses 50 bills
Code #2 loses 10 bills	Code #2 gains 10 bills
Code #3 loses 50 bills	Code #3 gains 100 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #5: Proposal to clean up litter along the highway.

Amount of Energy: 150,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 25 bills	Code #1 gains 30 bills
Code #2 gains 10 bills	Code #2 loses 5 bills
Code #3 gains 50 bills	Code #3 loses 25 bills
Code #4 loses 5 bills	Code #4 gains 5 bills

ISSUE DESCRIPTION #6: Proposal to build a new low income clinic.

Amount of Energy: 250,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 50 bills	Code #1 gains 50 bills
Code #2 gains 5 bills	Code #2 loses 5 bills
Code #3 gains 15 bills	Code #3 loses 15 bills
Code #4 loses 5 bills	Code $3 gains 10 bills

ISSUE DESCRIPTION #7: Proposal to start free bus service for senior citizens.

Amount of Energy: 200,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 100 bills	Code #1 gains 100 bills
Code #2 gains 10 bills	Code #2 loses 10 bills
Code #3 loses 5 bills	Code #3 gains 5 bills
Code #4 loses 10 bills	Code #4 gains 10 bills

ISSUE DESCRIPTION #8: Proposal to open a chain hamburger outlet.

Amount of Energy: 250,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 50 bills	Code #1 loses 75 bills
Code #2 loses 10 bills	Code #2 gains 10 bills
Code #3 loses 25 bills	Code #3 gains 25 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #9: Proposal to build a new playground.

Amount of Energy: 200,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 25 bills	Code #1 loses 25 bills
Code #2 gains 10 bills	Code #2 loses 10 bills
Code #3 gains 5 bills	Code #3 loses 5 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #10: Proposal to construct a new housing development.

Amount of Energy: 250,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 100 bills	Code #1 loses 150 bills
Code #2 loses 15 bills	Code #2 gains 10 bills
Code #3 loses 75 bills	Code #3 gains 100 bills
Code #4 gains 10 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #11: Proposal to allow the adult education program to include airplane flying.

Amount of Energy: 150,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 25 bills	Code #1 loses 25 bills
Code #2 gains 25 bills	Code #2 loses 50 bills
Code #3 loses 10 bills	Code #3 gains 10 bills
Code #4 loses 5 bills	Code #4 gains 5 bills

ISSUE DESCRIPTION #12: Proposal to issue ten more taxi permits.

Amount of Energy: 200,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 10 bills	Code #1 loses 5 bills
Code #2 loses 5 billsl	Code #2 gains 5 bills
Code #3 loses 30 bills	Code #3 gains 10 bills
Code #4 loses 5 bills	Code #4 gains 5 bills

ISSUE DESCRIPTION #13: Proposal to repair the water treatment plant.

Amount of Energy: 100,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 10 bills	Code #1 loses 10 bills
Code #2 gains 10 bills	Code #2 loses 10 bills
Code #3 gains 5 bills	Code #3 loses 5 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #14: Proposal to add three patrol cars to the police force.

Amount of Energy: 100,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 20 bills	Code #1 loses 20 bills
Code #2 gains 5 bills	Code #2 loses 5 bills
Code #3 loses 10 bills	Code #3 gains 10 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #15: Proposal for the hospital to buy new heart treatment machine.

Amount of Energy: 100,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 20 bills	Code #1 loses 20 bills
Code #2 gains 5 bills	Code #2 loses 5 bills
Code #3 gains 5 bills	Code #3 loses 5 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #16: Proposal to start a new counseling office.

Amount of Energy: 100,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 50 bills	Code #1 gains 75 bills
Code #2 gains 50 bills	Code #2 loses 25 bills
Code #3 gains 10 bills	Code #3 loses 10 bills
Code #4 gains 10 bills	Code #4 loses 10 bills

ISSUE DESCRIPTION #17: Proposal to build a new department store.

Amount of Energy: 300,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 100 bills	Code #1 loses 150 bills
Code #2 gains 5 bills	Code #2 loses 5 bills
Code #3 loses 100 bills	Code #3 gains 100 bills
Code #4 loses 5 bills	Code #4 gains 5 bills

ISSUE DESCRIPTION #18: Proposal to build a public swimming pool.

Amount of Energy: 150,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 25 bills	Code #1 gains 25 bills
Code #2 gains 25 bills	Code #2 loses 10 bills
Code #3 gains 5 bills	Code #3 loses 5 bills
Code #4 gains 5 bills	Code #4 [illegible] 5 bills

ISSUE DESCRIPTION #19: Proposal to build a new office building.

Amount of Energy: 300,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 150 bills	Code #1 loses 150 bills
Code #2 loses 25 bills	Code #2 gains 10 bills
Code #3 loses 50 bills	Code #3 gains 50 bills
Code #4 gains 10 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #20: Proposal to begin a new driver education course.

Amount of Energy: 50,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 5 bills	Code #1 loses 5 bills
Code #2 gains 20 bills	Code #2 loses 20 bills
Code #3 gains 5 bills	Code #3 loses 5 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #21: Proposal to install a traffic light.

Amount of Energy: 10,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 5 bills	Code #1 loses 5 bills
Code #2 gains 5 bills	Code #2 loses 5 bills
Code #3 gains 5 bills	Code #3 loses 5 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #22: Proposal to allow the electric company to put new power lines through town.

Amount of Energy: 25,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 50 bills	Code #1 loses 25 bills
Code #2 loses 10 bills	Code #2 gains 5 bills
Code #3 loses 50 bills	Code #3 gains 25 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #23: Proposal to build a new shopping center near town.

Amount of Energy: 300,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 150 bills	Code #1 loses 100 bills
Code #2 gains 5 bills	Code #3 loses 5 bills
Code #3 loses 100 bills	Code #3 gains 100 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #24: Proposal to build a new solar energy plant.

Amount of Energy: 10,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 75 bills	Code #1 gains 50 bills
Code #2 gains 20 bills	Code #2 loses 20 bills
Code #3 gains 50 bills	Code #3 loses 50 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #25: Proposal to allow research on converting french-fry oil into diesel fuel.

Amount of Energy: 5,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 25 bills	Code #1 gains 25 bills
Code #2 gains 20 bills	Code #2 loses 15 bills
Code #3 gains 20 bills	Code #3 loses 15 bills
Code #4 gains 5 bills	Code #4 loses 5 bills.

ISSUE DESCRIPTION #26: Proposal to open a clinic to treat respiratory diseases.

Amount of Energy: 200,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 25 bills	Code #1 gains 25 bills
Code #2 gains 50 bills	Code #2 loses 50 bills
Code #3 gains 10 bills	Code #3 loses 10 bills
Code #4 gains 5 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #27: Proposal to begin a meals-on-wheels program.

Amount of Energy: 75,000 barrels

Council Votes Yes	Council Votes No
Code #1 loses 5 bills	Code #1 gains 5 bills
Code #2 gains 5 bills	Code #2 loses 5 bills
Code #3 gains 5 bills	Code #3 loses 5 bills
Code #4 loses 5 bills	Code #4 gains 5 bills

ISSUE DESCRIPTION #28: Proposal to build a new elementary school.

Amount of Energy: 250,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 20 bills	Code #1 loses 20 bills
Code #2 gains 20 bills	Code #2 loses 20 bills
Code #3 gains 5 bills	Code #3 loses 5 bills
Code #4 gains 10 bills	Code #4 loses 10 bills

ISSUE DESCRIPTION #29: Proposal to extend the bus service.

Amount of Energy: 150,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 5 bills	Code #1 loses 5 bills
Code #2 gains 5 bills	Code #2 loses 5 bills
Code #3 gains 10 bills	Code #3 loses 10 bills
Code #4 gains 10 bills	Code #4 loses 5 bills

ISSUE DESCRIPTION #30: Proposal to build a new multi-use park.

Amount of Energy: 300,000 barrels

Council Votes Yes	Council Votes No
Code #1 gains 150 bills	Code #1 loses 150 bills
Code #2 loses 20 bills	Code #2 gains 20 bills
Code #3 loses 100 bills	Code #3 gains 150 bills
Code #4 gains 5 bills	Code #4 loses 10 bills

II SCIENCE UNITS

I. WHAT ??? KINDS OF ENERGY

Energy? What is it? A textbook definition might be: the ability to do work. Electricity is energy that does work; it powers a fan. The car your family owns runs on energy, gas. You run on energy, chemical energy, you get from the food you eat. The sun gives off energy in the form of light which helps you to see and warmth you can feel. Energy may take many forms. There are five major sources of energy that are available to us: solar energy, fossil fuels, nuclear energy, geothermal energy and tidal energy.

Solar energy is energy that comes from the sun. It comes to us as light. It is used by man to grow crops, for food and other products. Plants use sunlight for energy. There are a few houses in the United States which use solar energy to heat or cool their homes.

Fossil fuels are the chemicals which are stored in the ground made from decayed plants and animals from millions of years ago. Examples of these are coal, oil and natural gas. These are used to heat our homes and to produce electricity in generating plants. This electricity is then used to produce manufactured goods. Cars, planes and boats also use fossil fuels.

Nuclear energy is energy which is produced by the rearranging of particles that make up an atom. The energy that holds these particles together is released when they are changed or moved about. Nuclear energy is used by the Navy to power ships and submarines. It is used a little in generating plants to make electricity.

Geothermal energy is the heat energy given off by molten magma (or melted rock) below the earth's surface. Water heated by this magma produces steam and powers generators to make electricity.

Tidal energy is energy stored in the motion of the oceans due to the moon. The rising and lowering of the water (tides) has been used to produce electricity in other countries.

The list below shows the amount of energy the United States uses from each source.

Fossil Fuels	95%
Solar Energy (Hydroelectric)	4%
Nuclear Energy	1%
Tidal Energy	0%

SO WHAT? Does energy play an important role in your life? What would happen if tomorrow we ran out of oil, gas and coal? Can we ever run out? Can we run out of solar energy?

NOW WHAT? List 25 things you can think of that are made with the use of fossil fuels. Example-1. clothes. List some things that don't use fossil fuels to be produced.

2. WHAT ??? AMOUNT OF ENERGY

Today we hear the word energy shortage more and more. What is a shortage? This is where the use is greater than the supply. We in the United States are beginning to use energy faster than we can produce it. Reasons for this are evident; more people own cars, air conditioners, more energy used to make more products, and More People. Well, let's drill more oil wells and dig more coal. Fine! Except for one thing. Fossil fuels (from which we get 95% of our energy) are running out! It is predicted that if we use no more energy per year than we are using now, we have enough oil and natural gas to last 100 more years.

Where Energy Goes (Trillions of Btu's)

(A Btu is a British Thermal unit which is the amount of energy needed to heat 1 pound of water 1° Fahrenheit.)

United States Totals

Years	1971	1975	1980	1985	2000
Trillions of Btu's	68,989	80,265	96,020	116,630	191,900

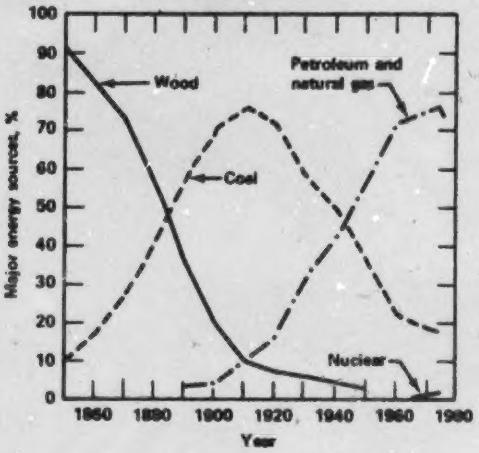
The increase in energy consumption in the United States will double in the next 24 years. If energy use keeps increasing as it has in the last few years we will run out of natural gas in 40 years. 10 or 20 years later we will run out of oil. So we have 60 years of natural gas and oil left. People are beginning to talk of conserving energy. That is — not wasting it.

It is estimated that the United States wastes 50% of its energy. The U.S. wastes 2/3 of the energy the rest of the world uses!

SO WHAT? Is there a problem? Why conserve energy?

NOW WHAT? List the ways individuals and families could conserve energy? What about cities, corporations, businesses? Would you be willing to try some of these? Do you think others would? Can energy conservation really make a difference?

HISTORICAL U.S.
ENERGY CONSUMPTION PATTERNS



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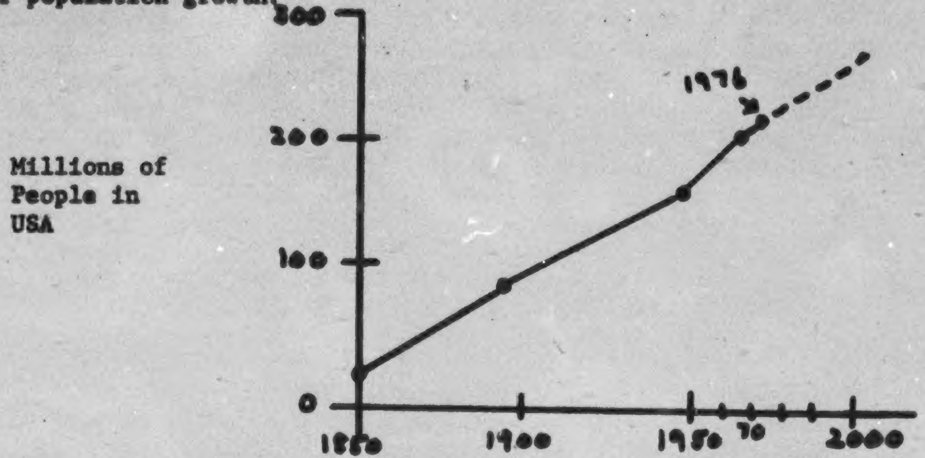
3. WHAT ??? ENERGY CONSERVATION

Energy conservation can help but not solve the problem. Some of the highest estimates predict 10% less use of energy. There are a number of other things that could also be done to help save. Some people believe we have to reduce our population growth.



If we reduce population growth the use of energy may also stop increasing at such an alarming rate. A change of lifestyle is an important idea also. People are moving to communes and sharing material things. People are doing away with their cars and riding bicycles or walking. Other people are doing away with electricity, air conditioning and electric lights.

SO WHAT? Do you think people will do this voluntarily? What could cause them to do this? What are some problems involved in a complete change of lifestyle like this?

NOW WHAT? What could you do to solve some of these problems? Considering the way people live in big cities, could energy problems cause economic disaster or even starvation? Could you cope with the energy problem easier in a rural area? Are cities bad? What bad things do you associate with cities? If you were in control of the United States, and could move people around any place you wished, draw or design or describe your idea of a city or town in which lifestyles could be changed.

4. WHAT ??? NEW ENERGY

Energy conservation, low population growth and change of lifestyles will have an effect on the amount of energy we use. Scientists are also looking at new energy sources. Solar, hydroelectric, nuclear, geothermal, and tidal energy contribute only 6% of the United States energy needs. Scientists are investigating these potential sources ideas a great deal now. Hydroelectric is the energy produced by damming a river and allowing the water to drive turbines and create electricity. Most of the locations where dams can be built are taken up by dams already. So hydroelectric power will never be a major source. Tidal energy demands very large changes in high and low tides. There are few places like this in the U.S., and these could only supply electricity to cities on the coast. Geothermal energy may help some but it can only be used in certain locations.

SO WHAT? Should we spend money developing types of energies that don't produce that much power? Can you think of ways some of the problems could be resolved?

NOW WHAT? Other than nuclear and solar, list other sources of energy that we could harness. Why do you think these you have listed haven't been developed? Are there ways to solve these problems? How will science develop new sources of energy?

5. WHAT ??? NUCLEAR ENERGY

Nuclear energy is a major topic in the nation today. Can we develop it in time? It takes about ten years to develop and finally build a nuclear power plant. It is estimated that if Florida's energy use increases at the same rate as now, by the year 2000 we will need a nuclear generating plant every ten miles all around the 1300 miles of Florida coastline. Nuclear reactors produce wastes that cannot be just thrown away. They have to be stored for at least 25,000 years in leak proof containers. It takes that long for them to become non-radioactive and harmless. Also they would have to be guarded because someone could make a bomb out of them. These wastes would have to be transported to some lonely site. What if a truck carrying these wastes turned over in your front yard? People are afraid of nuclear reactors for good reason. That is why it takes about ten years for one to be built. It also takes 700 million dollars just to build one plant.

SO WHAT? Should we go ahead and start building nuclear power plants? If you were the President and had to decide for or against, how would you vote? Why would you vote that way?

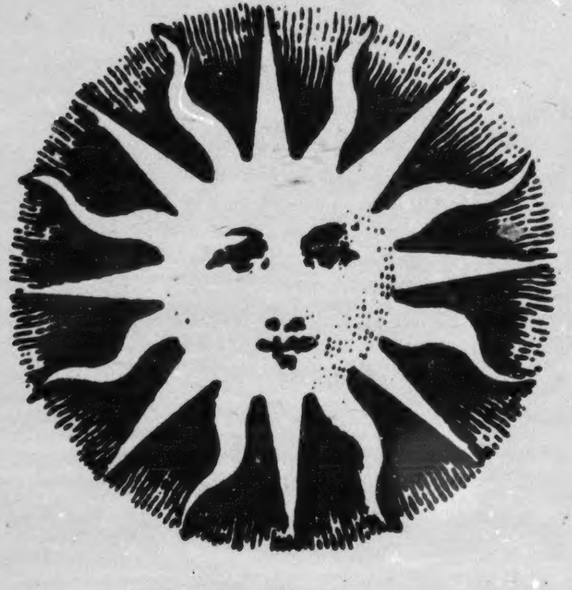
NOW WHAT? Uranium 235 and 238 are the types of radioactive material used in nuclear plants and there is a limited supply available. Take a poll of the class to see how many are for and how many against increasing the number of nuclear plants. If there are students in opposition, have panel discussions on their reasons for these judgments. Why do you think a lot of people are for nuclear power?

6. WHAT ??? SOLAR ENERGY

Solar energy is the most abundant energy in the world. But scientists are still having problems in harnessing it. If all the solar energy reaching the ground could be stored for 48 minutes, it could provide as much energy used by the whole world during the year, 1970. The sun provides energy for plants to grow but this is a small portion of all the energy hitting the earth. Energy is also reflected back into space. The land and oceans absorb some as heat. Scientists have not perfected practical and cheap ways of collecting solar energy and converting it into electricity. The life time of the sun is many billions of years, so our source will not run out. It's free. The sun's energy doesn't give off radioactive material or pollute the environment. The sun's energy is clean.

SO WHAT? Should we continue to develop this natural source of energy? Many people say solar is the only way to go. Many others say solar never will be able to supply all of our needs. How do you feel about these two statements? Why?

NOW WHAT? If you were the President of a Power Corporation and you had 700 million dollars to spend, would you spend it on a nuclear plant that a city needs badly for electricity but takes ten years to build or spend it on the development of solar energy? Why? Does the environment stand to be affected by either of these two energy sources from use? Should we be concerned about the environment?



7. WHAT ??? DISTINGUISHING USE OF ELECTRICAL ITEMS IN YOUR DAY TO DAY LIFE

Using the chart below, list those items commonly used in the home/school which are now considered luxury items, convenience items, and necessary items:

LUXURY	CONVENIENCE	NECESSITY

Are there any items in the "necessity" column that were once considered either "luxury" or "convenience" items? Are there any "luxury" or "convenience" items that may become a "necessity" in the future?

SO WHAT?

1. **Define: luxury, convenience, and necessity.**
2. **How does an item become a luxury; a convenience; or a necessity?**

NOW WHAT?

1. **Choose a friend and try to reach as many conclusions as you can about their opinions, biases, etc., regarding a luxury, a convenience and a necessity.**
2. **Locate things both inside and outside of your school that represent energy. If they were eliminated, what effect would this have on your school?**

8. WHAT ??? NATURAL GAS AND U.S. ENERGY 1970 AND 1975

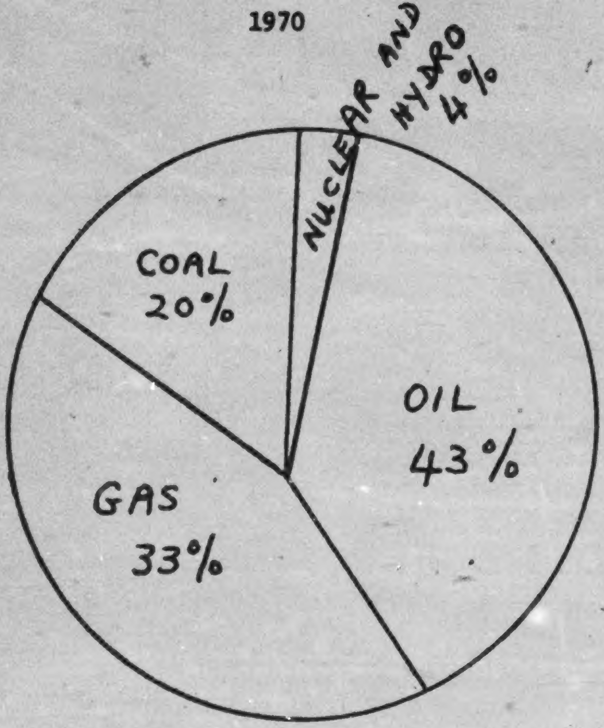
Examine the two graphs below. What do they tell you?

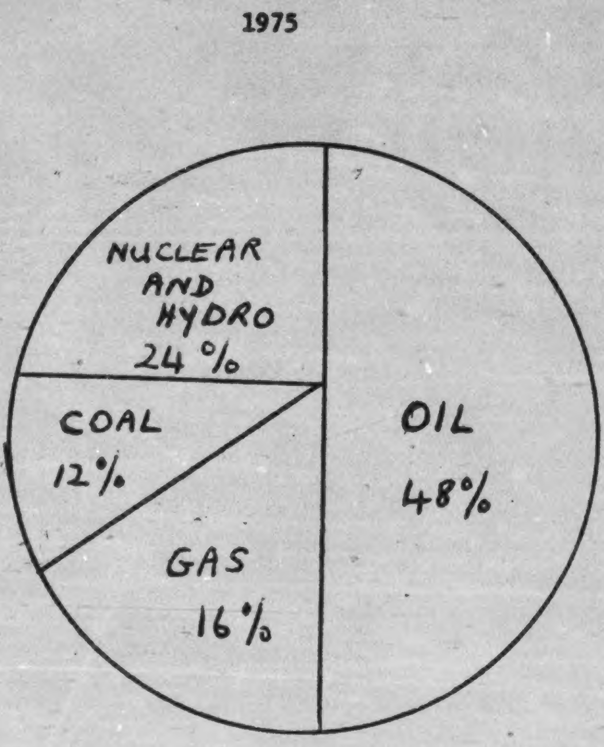
SO WHAT?

1. Does it tell you anything about your resources?
2. Does the data suggest any environmental problem that might exist in your community? What?
3. What trends do the charts predict?

NOW WHAT?

1. Establish an Energy Fact Finding Committee, to collect information concerning the amount of natural gas used in this area.
2. Compute the difference in the amount of heat required to heat a house to 70°F rather than 65°F. Assume the house has 1500 square feet.





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9. WHAT ??? CONSERVATION - HOW IT ALL ADDS UP!

Horatio Horrible High School used 12,600 gallons of heating oil last year. They kept the thermostat set at 74°F.

1. How many gallons of heating oil would they save if they could cut their fuel usage 20% by setting the thermostats at 68°F?
2. How much did heating oil cost them last year selling at 25¢ per gallon?
3. This year fuel costs are up to 30¢ per gallon, but what will be the cost of fuel for the year if Horrible High takes advantage of the 20% reduction in usage?

Mr. I.M. Loaded owns an expensive car which averages 7.8 miles per gallon when driven at 70mph; 9.6 miles per gallon at 60mph; and 10.9 miles per gallon when driven at 50mph. If Mr. Loaded drove from Miami to Tallahassee, a distance of approximately 460 miles;

4. How many gallons of gasoline would he use if he drove the distance at 70mph?
5. How many gallons of gasoline would he use making the same trip at 50mph?
6. How many gallons of gasoline could he save by driving at 50mph instead of 70mph? Round trip?
7. If gasoline is priced at 61.9¢ per gallon, how much money could he save going one way? Round trip?

SO WHAT? If Horrible High School and I.M. Loaded saved money by lowering the thermostat in winter and driving at slower speeds, could these same savings plans work for your family? Estimate how much your family could save in 3 months. What would you like to do with the money you've saved?

NOW WHAT? THINK BIG on savings! Don't stop here! You can increase that little nest egg even more. Think of more ways to save energy dollars

10. WHAT ??? MORE ENERGY BINGO!

Provide a bingo grid for each student. Ask them to mark each block with an X when they find what is described. This can be completed either as a school or home assignment that allows students to become more aware of their surroundings.

E	N	E	R	G	Y
Room w/thermostat below 78° in summer, 68° in winter	Small portable space heater or fan in use	Color TV with "instant" on feature	Car idling with no driver	Overheated or over-cooled public building	Car speeding over 55mph
Door or window open with heat or ac on	Utility bill repeatedly higher than neighbors	Lights on in unoccupied room	Jalousie windows	Lights on in hallway midday	Washing machine using cold water only
Car accelerating smoothly and slowly	Solid state (no tubes) black & white TV	Dripping hot water faucet	Weather-stripping around outside doors	Open refrigerator in grocery stores	Car coming to a quick stop (tires squealing)
Electric blanket in use	Car with only one passenger	Nighttime illumination of a public building	Water heater with thermostat set above 140°	Gas pilot light burning	Outside light burning during the day
Mobile home or classroom without underpinning	Car accelerating rapidly (tires squealing)	Car with a V-8 engine	Large wattage bulb used where a smaller one would do	Window air conditioner without plastic cover in winter	Self-cleaning oven
Compact car with small 4-cylinder engine	Fluorescent tubes instead of incandescent bulbs	Frost-free refrigerator	TV or radio playing with no-one in the room	Car easing to a smooth stop	Electric knife in use

SO WHAT? After completing the game, ask students to identify the energy savings blocks vs. the energy wasting blocks by shading.

NOW WHAT? Ask students to list what they discovered!!

II. WHAT ??? AN ENERGY CRISIS IN FLORIDA

Assume that you are the Governor of Florida (some day you may be!) There is an energy crisis. Florida has been unable to import any gas, oil, or coal from foreign countries. The other states of the United States have only enough energy (fossil fuels) for themselves. The few oil fields in Florida can produce only 10% of the present demand for energy. The state can meet its energy demand for one year with present storage of fuels. What are you doing to do to meet the future energy demands?

SO WHAT? Electric utilities need oil, gas, or coal to produce electricity. Industries need fuel to manufacture materials and artificial foods. Can Florida build hydroelectric plants that are energy efficient? Does Florida have uranium ore reserves? Nuclear power? Should money be invested in research to lower the cost for converting solar energy to other kinds of energy?

NOW WHAT? You, as the Governor, must come up with a plan to meet the energy demand of all of the citizens of the state. You must plan how you are going to allocate the 10% and how you are going to meet the other demands.

1. How are you going to make allocations of the 10% that the state produces?
2. How much would you allocate to the following units? Business and industry? Public institutions such as schools and universities? Recreational facilities (parks, sport fishing, bars, country clubs)? Residences (city dwellers, farmers)? Churches? Government units (firemen, policemen)? Hospitals?
3. Write a statement explaining the amount you would give to each unit, your reason for allocating to the unit or the reason for not allocating to the unit.
4. Make a list of energy conservation techniques that could be employed by the residential units.
5. List the alternative energy sources that you would recommend for the Florida citizen.
6. Discuss your plan with your neighbors, classmates, and parents. Send your plan to the Governor!

I2. WHAT ??? ENERGY IN LIVING SYSTEMS

During photosynthesis, green plants change solar energy into chemical energy. This chemical energy is stored in complex chemical molecules.

SO WHAT? All living organisms require energy to maintain life functions. Energy may be changed from one form to another form. Solar radiation is the only source of energy that living organisms can use to live.

NOW WHAT? Chemical energy in plant leaves is often stored in the form of starch. This starch is made from glucose, a form of sugar.

Materials: Iodine solution, 125 ml beaker half filled with alcohol, 250 ml beaker half filled with water, source of heat, green plant (bean, begonia, etc.), petri dish, corn starch.

Activity: 24 hours before this activity is to be carried out, cover several of the leaves with a material that is impermeable to sunlight (foil, etc.).

1. Drop some iodine on a small bit of the cornstarch. Observe the blue black color which is a positive test for starch. Drop some iodine on a piece of white paper. Why did the paper turn blue black?
2. Select a leaf that was exposed to the light for 24 hours and select one that was darkened for 24 hours. Mark them in such a way that you can identify each.
3. Place the large beaker on the heat source.
4. Place the leaves in the small beaker and place this beaker inside the large beaker.
5. Leave the leaves in the beaker until they turn white. Then remove the leaves from the beaker.
6. Wash the leaves with water and dip them into a dish of iodine solution.

Questions:

1. What happened to the leaf kept in the light?
2. What happened to the leaf kept in the dark?
3. Explain any color change that occurred in the leaves when dipped in the iodine.
4. What did the experiment tell you about the relationship between sunlight and the production of starch?
5. How many things do you consume daily or use daily that have starch in them? Make a list of them.

13. WHAT ??? THE NEWLYWED GAME

The class is divided into pairs of newlyweds faced with a list of immediate decisions that must be made. Based on their occupations, projected income, and preferred lifestyle the couples must develop a list of criteria for a place to live, a place of employment, a means of transportation, and any other items or resources they will need to "set up housekeeping." Then, they must determine that their plans are realistic by: balancing a budget; locating available housing; pricing items that will have to be purchased; talking through an imaginary week to make sure that they have worked out all of their needs as well as their leisure time activities.

SO WHAT? After they are set in their imaginary routine, they arrive home to discover a newspaper on their doorstep headlined, "NEW OIL EMBARGO: TALKS DEADLOCKED." As they read on they realize that this embargo will affect more than the price of gasoline and is likely to be extended indefinitely. The President has responded to the emergency by ordering a 50% reduction in all petroleum consumption effective at midnight. This means that oil-using power companies will be allowed to produce only half as much electricity, service stations will be allocated even less than half of their present gasoline allotment because of a priority rating for emergency vehicles, one member of each pair will lose their job (the most energy dependent occupation of the two), ... and so on. The couples ~~are to~~ predict the immediate and longer range effects that this will have on their lives as well as how they will adjust their lifestyles to accommodate these constraints.

NOW WHAT? Students can now drop their roles and answer the following:

1. Knowing in advance that an "energy crisis" was imminent, could you redesign a more energy-efficient or energy-independent lifestyle? Specifically, what would you do differently?
2. If you were convinced that the per-capita energy consumption of all U.S. citizens would have to decline appreciably in the remainder of this century, never again rising back to its present height, would you plan any differently for YOUR lifestyle (those things you want to do, become, and have)?
3. What do you think would be the most effective means of convincing people of the need for adopting more energy-efficient lifestyles?

THE NEWLYWED GAME

-Page 2-

Needs Checklist:

Type of dwelling (house, trailer, apt.)
Location of dwelling
Size (number of rooms, etc.)
Heating and air conditioning preference
Recreational access
Laundry facilities
Possible occupations
Place of employment
Means of transportation
Furnishings
Kitchen equipment
Linens
Appliances
Others

Monthly Budget:

Income __________

Expenses - __________ = ____________

Rent	Medical	
Electricity	Insurance	
Water	Clothing	
Sewage	Household items	
Telephone	Laundry	
Cable TV	Recreation	
Food	Time payments	
Transportation	Savings	

14. WHAT ??? CONSERVING ELECTRICITY IN THE HOME

Using the annual cost of operation chart below. Record the annual amount of electricity in terms of dollars figures for each of the following electrical items.

APPLIANCES	AVERAGE WATTAGE	ANNUAL KWHR CONSUMPTION	ANNUAL COST $
Toothbrush	7	0.5	.01
Water Heater (standard)	2,475	4,219	111.04
Radio	71	86	2.26
Range	12,200	1,175	30.93
Shaver	14	1.8	0.5
Freezer (Frostless, 15 cu.ft.)	440	1,761	46.35
Air Conditioner (room)	1,556	1,389	36.56
Television (color-Solid State)	300	600	17.37
Refrigerator (Frostless, 14 cu.ft.)	615	1,829	48.14
Dishwasher	1,201	363	9.55

SO WHAT?

1. Which of these electrical items use the most electrical energy?
2. Which of these electrical items use the least energy?

NOW WHAT?

1. Compare and contrast the amount used and the benefits received from the pairs of alternatives:
   a. Watching T.V. vs. Reading a book
   b. Brushing teeth by hand vs. Electric toothbrush
   c. Shower vs. Bath
   d. Gas stoves vs. Electric range
   e. Electric razor vs. Blade razor
2. Read power consumption data on appliances.
3. Explore techniques of electrical energy measurements.
4. Set up a display of electricity-powered items and nonpowered counterparts.
5. What other criteria should be used to evaluate these appliances?

I5, WHAT ??? WINTERIZATION OF THE CLASSROOM

When the students come in on some unusually cold winter morning complaining about the temperature in the classroom, the stage is set for a discussion of energy. Through the personal experience of being cold (even though the heater is working harder than ever), your students should be more than willing to determine what the problem is and then ....

SO WHAT? What is causing the problem? Is there really a problem? How warm does the body actually need to be in order to survive? Does what we eat have anything to do with the ability of our body to keep warm?

NOW WHAT? Are there any solutions? If so, what are they? Can we ourselves do anything to solve these problems?

Example:

1) Every year there are four to ten days during which the heating in my science classroom is not sufficient to provide a comfortable level of warmth. The students are shocked and immediately produce a variety of suggestions for keeping warm, most of which involve some form of producing more heat. This usually involves turning on all the bunsen burners and alcohol burners as well as many other less practical suggestions. The discussion seldom, if ever, turns toward a true analyzing of the problem.

2) In reality the heaters are perfectly adequate for any room of the same volume which does not have 480 square feet of poorly constructed windows allowing the heat produced to readily escape. The teacher may make suggestions which will lead the discussion in the direction if no students do so.

3) What are the possible solutions? The most obvious solution is some means of sealing the windows so that the heat does not escape - perhaps covering the windows with plastic. Your students may be able to supply the materials and actually do the work. If you take data before application of the plastic and after you will also have a basis for comparison. This data may include indoor and outdoor temperatures, thermostat settings and numbers of hours of sunshine per day.

16. WHAT ??? FOSSILS, FOSSILS EVERYWHERE...

Make a list of everything you have touched today. For each item carefully think about how it was made and delivered to you. For each item describe the role of fossil fuels played in its manufacture and distribution.

SO WHAT? An item may go through several changes while it is being made. Its "raw materials" are whatever it was made of before its first man-made change. Use a reference book (textbook, encyclopedia, dictionary) to list which of your items were made from fossil fuels.

NOW WHAT? Getting and distributing food uses up as much as 10 times as much fossil fuel energy as the food gives us. In simpler cultures food yields at least 10 times as much energy as it takes to produce and distribute it. For all energy sources and uses in the U.S. economy, getting and distributing energy requires 6 times as much energy as is useable at the point of use. It takes 5 times as much energy to make a pound of plastic as a pound of steel. These data show very inefficient uses of our shrinking supplies of fossil fuels. Respond to the following questions:

1. How can we get the most energy out of our manufactured goods for each calorie of energy we put into them?
2. Think about how society should change so it doesn't use up so much energy in providing us with goods and services. Would you want to live in such a situation? Explain.
3. What can you do now to increase the energy efficiency of the process which provides you with manufactured goods? What will you do? Explain.

FUELS AND ENERGY SOURCES

- Coal
- Crops grown for energy
- Fertile nuclear
- Fissile nuclear
- Geothermal
- Hydroelectric
- Natural gas
- Ocean heat
- Oil
- Oil shale and tar sands
- Sunlight
- Tides, waves, and ocean currents
- Waste heat
- Waste materials
- Water (fusion and hydrogen)
- Windpower

17. WHAT ??? FOSSIL FUEL SUPPLY AND DEMAND

Read the quotations provided with this unit. The American Petroleum Institute is an association of producers and sellers of oil products. The Energy Research and Development Administration is the agency of the federal government responsible for establishing procedures and money for assuring sufficient energy. Common Cause is a large organization carrying the concerns of consumers to government and business leaders. You need to remember that your car's fuel, which you call "gas," is really gasoline and is made from petroleum (crude oil). In these quotations "gas" is not a liquid but a gas that comes from the ground and is burned to produce heat.

SO WHAT?

After you've read the quotations, respond to the following questions individually (on your own paper) or in groups.

1. In what ways are the 3 positions similar?
2. In what ways are they different? Why are they different?
3. What points of each position are fact, as far as you are concerned? Why?
4. What points of each position do you believe are not based on fact but represent the opinion and value of the writer? Why?
5. Which opinions or values expressed in these positions do you share? Why?
6. Which opinions or values do you not share? Why?
7. Why is Common Cause unsure of the fuel industry's analysis and predictions of the energy problem?
8. Are there other sources of energy for us to use when oil and gas are gone?
9. From what you've read and thought about, do you believe you will live to see oil and gas disappear as fuels in this country? Or is this a scare tactic by oil companies to increase prices and profits?

NOW WHAT?

Respond to the following questions.

1. In 1972 17% of this country's energy was supplied by coal. In your lifetime what will happen to this number? How do you feel about this happening?
2. If you're average, you use at least 10 times as much energy as someone from a developing country. During your lifetime what will happen to this number? Why? If the number decreased, would it be only because you used less energy?
3. The federal government has regulated the price of fossil fuels, keeping their price as low as possible. Should the demand for energy be reduced by making fossil fuels more expensive? How would that affect your use of energy?
4. The short-term supply of energy may be limited but many people likely will not conserve energy but their use of energy will increase. Think about all the factors that contribute to the demand for energy in the world and the U.S. What is one way of solving the energy problem that wasn't discussed in these quotations? Would you help in this way? Why?
5. What actions can you take to respond to the energy problem? What actions will you take? Why?

FOSSIL FUEL SUPPLY AND DEMAND

Quotations

American Petroleum Institute, 1973

The U.S. has one of the highest per capita incomes in the world and with less than 6% of the earth's population-it accounts for 1/3 of the total energy consumption of the world. With regard to the total energy needs in the U.S. in 1972, for example, oil accounted for 46% and natural gas for 32%. Coal provided for 17% and water power 4%. In that year the U.S. consumed 6 billion barrels of oil but it produced only 3 1/2 billion. By 1985 consumption of total energy is expected to increase by more than 60%. At some future point, when population and social growth have reached an optimum, energy demand will level off. Certainly, however, the demand will be increasing at least until 2000 A.D. The nation's proved reserves of oil and natural gas is 43 billion barrels. Improved recovery techniques could add 5.2 billion barrels. Experts currently estimate that the oil shales in the U.S. represent a total of about 2 trillion barrels of oil in place. While no one can know precisely just how extensive our ultimate reserves are until they have actually been found and produced, it appears that the U.S. will have adequate petroleum resources to meet the demands of the foreseeable future, though costs will likely be higher.

Energy Research and Development Administration, 1975

Each American is using about 4 times more energy than his great-grandparents. He uses twice as much as a person in Great Britain and from 10 to 100 times the amount of energy used by someone in a developing country. At its present rate of usage and growth, the known U.S. reserves of coal that can be economically recovered by present methods would last 500-600 years. Natural gas is being discovered at a slower rate than it is being used and U.S. reserves could be exhausted by 2000 A.D. The U.S. uses more than 14 million barrels of oil each day. It has oil reserves of 35-40 billion barrels and of oil each day and experts estimate that undiscovered, economically recoverable oil may range from 60 to 400 billion barrels.

Peter Butzin, Common Cause, 1976

The "energy crisis" of 1973 left a lasting legacy of distrust. Scare tactics were used to bludgeon the public into accepting natural gas deregulation. Rather than arguing the case on its merits, natural gas producers and the Administration subjected the public to 3 years of ballyhooed natural gas "shortages," with dire predictions of mass unemployment and economic chaos. Evidence that producers concealed or under-reported reserves to stampede legislation and that they withheld supplies from pipelines in violation of contracts did little to reduce the climate of distrust. There is a desperate need to make information available on reserves, prices, and profits. An uninformed public will be unable to understand the seriousness of our energy problems or wisely judge prpposed solutions in the absence of adequate information. For too long, energy industries have held a jealously guarded monopoly on this necessary information. Energy policy must put a great stress on conservation and, in the near term, make use of mandatory measures and financial incentives rather than on higher prices. (At higher energy prices) the poor face a price crisis, soon they will not be able to afford energy, regardless of its availability. The non-poor, who can afford some price rises, are more concerned with having a guaranteed supply. It is easier for the foreseeable future, to affect demand than supply because 1) we have such a huge potential for greater efficiencies, 2) the likelihood of increased supplies of fossil fuels is limited, and 3) increased supplies from new technologies will not be available for many years.

18. WHAT ??? IT'S YOUR MONEY

Study the information sheet. Pay close attention to the assumptions. Assumptions 3 and 4 are realistic, according to current trends and the price increases expected to follow the end of the government's control of fuel prices. Remember that every item in these tables involve fossil fuels in its manufacture and distribution. Therefore, the cost of its purchase and operation depend upon the prices of fuels. Assume that the table refers to the family made up of your parent(s), brother(s), and/or sister(s). Choose the table whose "now" column has numbers which are closer to the numbers describing your family. Answer the following questions on your own paper or in a group discussion.

1. How close do the numbers in the "now" column come to the situation in your family? (Ask your parents before you finish this lesson). What are the differences?
2. What things would you add to the "other" item that weren't mentioned in Assumption 2?
3. What problems do you have believing Assumptions 3 and 4? How do these reservations affect your interpretation of the table?
4. In 5 years, your family could no longer afford appliances (stove, refrigerator, dishwasher, can opener) and clothes, entertainment, etc. How would this affect you? What priorities would you want your family to follow in buying and using these items? How would you make your family follow them?

SO WHAT? Study the "now + 10 years" column. This refers to you with your own little family, income and expenses. Respond to these questions.

1. Assumption 5 indicates your income and optional expenses will be only 1/3 as much as those of your current family now (except for inflation) because you'll likely have a lower-paying job than your parent(s) now and the needs of your new family will be less. What problems do you have accepting this assumption? How do these reservations affect your interpretation of the table?
2. Would you be satisfied if your money were spent on optional things as shown in the table? What would you have to do to change your priorities? How would this affect your lifestyle? Would this new lifestyle be acceptable to you? Explain.

NOW WHAT? Fill in the "now + 20 years" column to show your own family. Calculate the numbers using the assumptions of the table. Remember that each year the expenses of each item will be 20% more than they were the previous year but the money available to pay them is only 10% more. So you will have to calculate new costs and incomes for every year during this 10-year interval. Answer the following questions.

1. Using these assumptions, which items will you be able to afford?
2. How could you change your priorities so you could afford a wider variety of these things? What effect would this have on you? Will it be possible for you to get ready for this new lifestyle between now and then?
3. What else can you do in the next few years to keep the prices of these fuels down? (Be specific). What will you do?

INFORMATION SHEET

IT'S YOUR MONEY

Monthly Income and Costs for Non-essential Items

Item	now	now + 5 yrs.	now + 10 yrs.	now + 20 yrs.
a) heating & cooling	$100	$250	none	
b) car(s)	$100	$250	none	
c) appliances	$50	none	$110	
d) food	$200	$500	$410	
e) other	$150	none	none	
TOTAL	$600	$1000	$520	

Item	now	now + 5 yrs.	now + 10 yrs.	now + 20 yrs
a) heating & cooling	$25	$60	none	
b) car(s)	$25	$60	none	
c) appliances	$12	none	$30	
d) food	$50	$125	$100	
e) other	$38	none	none	
TOTAL	$150	$245	$130	

Assumptions:

1. These numbers do not show what must be spent on buying shelter, taxes, insurance, medical bills etc.
2. The "other" category includes such things as clothes, entertainment, education and vacations.
3. Income increases about 10% per year. Thus the money available for these non-essential expenses also increases about 10% per year.
4. The cost of energy for items (a) - (e) increases about 20% per year.
5. In the "now + 10 yrs." column, costs and income will be one-third of what they are now, plus inflation.
6. "none" means there is no money left for this item, after the other items in the same column have been paid.

I9, WHAT ??? PERSONAL ENERGY INVENTORY

Your lifestyle depends on the kinds and amounts of energy available to you. Conservation efforts are essential in all aspects of energy usage in order to prevent drastic measures as were taken during the oil embargo.

SO WHAT?

Any change in the amount of energy available to you will affect your lifestyle.
Some of our energy sources are not renewable.
Your personal energy consumption can be measured.
Your personal energy conservation efforts can be detected and these efforts save Money.

NOW WHAT?

Do the following:

1. Make a list of the things that you and your family could do to save energy without being painfully uncomfortable.
2. Find your gas or electric meter (or both). Learn how to read them. Your teacher will help you with this after you have had ample time to learn it yourself.
3. Take a reading on a Sunday evening, read your meter again the following Sunday afternoon at the same hour as before. How much energy did you use?
4. Make a list of everything in your house that uses that energy.
5. Now work out with your family a plan you can use to cut down on the use of energy for one week. Write down your plan and try to get everyone to follow it.
6. Again, measure the amount of energy (gas or electricity) used over a week when your family was following your conservation plan. How much did you save? Could other factors such as cold or hot weather make a difference?
7. Compare your home's energy use with your classmates. Why are there differences.
8. Find out how much one kilowatt hour of electricity cost. Calculate the amount of money you saved on the family's utility bill.

> **"Nature never gives anything away.**
> **Everything is sold at a price.**
> **It is only in the ideals of abstraction**
> **that choice comes without consequence."**
> ***—Ralph Waldo Emerson***

20. WHAT ??? ENERGY VOCABULARY BINGO

Let's learn some energy words.

SO WHAT? With the advent of the energy crisis and growing concern for meeting future energy demands Americans are faced with a new vocabulary.
In order to know what's happening, it is necessary to know the language of energy.

NOW WHAT? Cardboard or paper may be used to construct the energy bingo cards.

1. Draw bingo cards with six squares across and six squares down.
2. Write the word E_1 N_1 E_2 R_1 G_1 Y_1 across the top of the cards.
3. Select as many vocabulary terms as you wish to be used under each letter. In this activity, only six terms were used for each letter. Vary this according to the number of cards you need.
4. Choose the number of cards you need, select 6 words at random for the cards. Vary the arrangement of the words so no two cards are the same.
5. Write the words in the squares.
6. The bingo caller will read the definitions that have been written on index cards. The participant or participants will cover the word defined on his or her card. Covers may be made of cardboard or even paper clips.
7. The first person to get 6 words in a row or diagonally wins the game!
8. An example of the cards and energy related terminology and definitions are included. There are many variations that you may use. Students can make their own cards. You may have them look up the definitions or you may give them the words and definitions for study before the activity.

Example for the Bingo caller: Under E_1, Power, the force which makes things happen, the ability to do work.

Participants: Cover the word energy.

SAMPLE ENERGY BINGO CARDS

E1	N1	E2	R1	G1	Y1
ENERGY	MATTER	COOLANT	CRISIS	URANIUM	SCRAM
ENVIRONMENT	POLLUTION	CORE	PETROLEUM	KILOWATT	SMOG
POPULATION	POWER	CURIE	GEOTHERMAL	FOSSIL FUELS	PIG
FOOD CHAIN	ATOM	FISSION	SOLAR	HYDROPOWER	COLLECTOR
KINETIC ENERGY	BTU	FUSION	METHANOL	NUCLEAR ENERGY	PHOTOCHEMICAL VOLTAIC CONVERSION
POTENTIAL	CALONE	RADIO	TURBINE	PHOTOVOLTAIC CHEMICAL	MEGAWATT
ENERGY		ACTIVE		CONVERSION	

E1	N1	E2	R1	G1	Y1
KINETIC ENERGY	POLLUTION	RADIOACTIVE	GEOTHERMAL	NUCLEAR ENERGY	PIG
FOOD CHAIN	MATTER	FUSION	SOLAR	HYDROPOWER	COLLECTOR
POTENTIAL ENERGY	CALORIE	FISSION	CRISIS	KILOWATT	PHOTOCONVERSION
ENVIRONMENT	POWER	CURIE	METHANOL	FOSSIL FUELS	MEGAWATT
ENERGY	BTU	CORE	TURBINE	PHOTOCHEMICAL	SMOG
				CONVERSION	
POPULATION	ATOM	COOLANT	PETROLEUM	URANIUM	SCRAM

ENERGY BINGO WORDS AND DEFINITIONS

E_1 VOCABULARY

1/ ENERGY = Power, the force that makes things happen, the ability to do work

2/ ENVIRONMENT = All of the things around us which affect us

3/ POPULATION = All of the persons, organisms or things in a certain place at a certain time

4/ FOOD CHAIN = The pathways by which energy passes from the first absorbing organism (plants) to animals and to humans

5/ KINETIC ENERGY = Energy possessed by objects in motion

6/ POTENTIAL ENERGY = Energy that is stored in matter because of its position

N_1 VOCABULARY

1/ MATTER = Anything that has mass and occupies space

2/ POLLUTION = The addition of any undesirable agent to an ecosystem

3/ POWER = The rate at which energy is used or generated. It is commonly measured in units such as horsepower or watts

4/ ATOM = The fundamental building blocks of chemical elements

5/ BTU = The amount of heat required to change one pound of water one degree fahrenheit

6/ CALORIE = The amount of heat required to change one kilogram of water one degree centigrade

E_2 VOCABULARY

1/ COOLANT = A substance circulated through a nuclear reactor to remove or transfer heat, usually water, heavy water or liquid sodium.

2/ CORE = The central portion of a nuclear reactor containing the fuel elements

3/ CURIE = The basic unit to describe the intensity of radioactivity in a sample material

4/ FISSION = The splitting of a nuclear of an atom into two approximately equal parts accompanied by the release of large amounts of energy

5/ FUSION = The formation of a heavier nucleus by combining two lighter ones with the release of energy. The sun heats the earth by this method

6/ RADIOACTIVE = Describes something which gives off rays of energy and parts of the nucleus of atoms

R_1 VOCABULARY

1/ CRISIS = A dangerous time or event that will have an important effect on the future.

2/ PETROLEUM = Natural oil as it comes out of an oil well

3/ GEOTHERMAL = Having to do with the heat inside the earth

4/ SOLAR = Of or from the sun

5/ METHANOL = A colorless, poisonous liquid made from wood and other things such as garbage. It can be used as fuel

6/ TURBINE = A type of engine which is turned by some liquid or gas hitting fan like blades

G_1 VOCABULARY

1/ URANIUM = A radioactive element with the atomic number 92. It is the basic raw material of nuclear energy

2/ KILOWATT = 1000 watts - a unit of power

3/ FOSSIL FUELS = Fuels derived from the remains of organic materials, including petroleum, natural gas, coal, oil shale, and tar sands

4/ HYDROPOWER = Energy in stored or moving water

5/ NUCLEAR ENERGY = Energy within the nucleus of an atom, may be released by fusion or fission

6/ PHOTOCHEMICAL CONVERSION = A chemical reaction which converts light to useable energy

Y_1 VOCABULARY

1/ SCRAM = The sudden shut down of a nuclear reactor

2/ SMOG = A mixture of smoke and fog

3/ PIG = A heavy shielding container (usually lead) used to ship and store radioactive waste

4/ COLLECTOR = The component of a solar run system which collects solar radiation

5/ PHOTOVOLTAIC CONVERSION = The conversion of the light from the sun into electricity by means of solid state devices

6/ MEGAWATT = 1,000,000 watts or 1000 kilowatts

21. WHAT ??? BIOENERGETICS

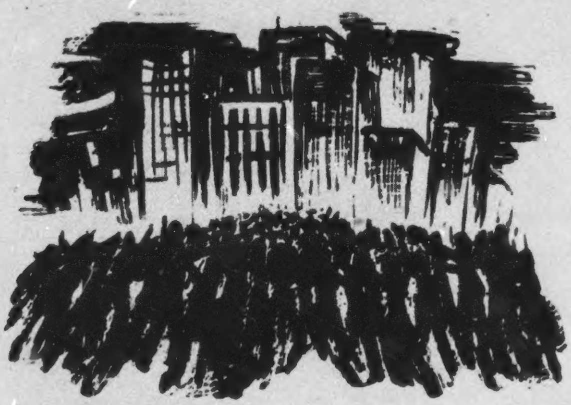
How can we use the "greenhouse effect" to grow plants and to conserve non-renewable energy.

SO WHAT? Simple technologies can have meaningful effects on energy conservation. This simple experiment will help you learn about the "greenhouse effect" and its implications for your life.

NOW WHAT? Construct a small greenhouse of glass and another of clear plastic. Install these side-by-side over newly planted seedlings, small rooted plants or cuttings. Put control plants beside each of the two "greenhouses." Include a thermometer and hydrometer in each. Read the temperature (celsius) and the humidity after the greenhouses and control are ready, one hour later the next day and daily for the next three weeks.

1. What differences did you record: in temperature, in moisture, and in the condition of the plants?
2. After three weeks observe the parts of the plants under the surface of the soil. What do you find?
3. What recommendations would you make to someone wishing to root cuttings or transplant difficult-to-move plants as a result of this experiment? Would your recommendation vary according to the season of the year? In what way? Why?
4. How would you vary these "climate" conditions (heat, moisture) for animals? For people?

MORE: Let's apply what you have learned from this experiment to the problem of making homes more livable, usable, and comfortable. What climatic conditions need to be controlled for "optimal liveability." What is the most efficient "range of temperatures" for the human animal? How may the range be maintained during the spring, summer, fall, and winter without using excess energy?



22. WHAT ??? PETROLEUM - TOO VALUABLE TO BURN

Petroleum has an abundance of valuable chemicals that are useful in medicine, foods and as everyday products.

SO WHAT? When we burn petroleum, most of these valuable chemicals "go up in smoke." Perhaps petroleum might better be used as a source of chemicals instead of as a fuel

NOW WHAT?

1. Assemble as many of the following items as possible: plastic milk jug, styrofoam cup, nylon jacket, myrex or other insecticide, aspirin, foam pillow, chemical fertilizer, phonograph record, roll of film, detergent, varnish, fake fur, etc.

2. Discuss the following questions:
   a. What do these articles have in common?
   b. What other items are made from petroleum?
   c. What might happen to the price of these articles if there was another oil embargo?
   d. When the world exhausts its oil supply, what will run generators, cars, planes, etc.?
   e. Are there some of these articles that could be replaced by something else? Are there some that could not?
3. Break the class into small groups. Ask each team to bring as many non-petroleum made articles that could be submitted for the petroleum articles as they can find. Allow teams time to discuss what each member will bring.
4. The following day, list the synthetic materials on the board. Have each team present their alternative articles and list them across from the synthetic ones.
5. Ask the class:
   a. Which articles could be easily replaced with an alternative? Are there any that cannot be replaced?
   b. Which article is better, the synthetic or the substitute? Have small groups pick a pair of articles and list the advantages and disadvantages of each. Put the following words on the board and suggest that students consider them in making their analysis: cost, labor, environment, production, durability, appearance, etc. Have each group present their evaluation of their articles. They should be prepared to defend their choice.
   c. Some people say petroleum is too valuable to burn. Do you agree with this statement? Why or why not?

MORE:

1. Make a poster or bulletin board of petroleum articles used every day.
2. Try to go a whole day without using anything made from petroleum. Can this be done?
3. Invent useful or artistic items from discarded plastic, styrofoam, etc.
4. Prepare one of the following in the lab: aspirin, nylon, soap, etc.
5. Petroleum is often processed by fractional distillation. Do a simple fractional distillation in the lab.
6. The two main types of petrochemicals are aliphatics and aromatics. Find out what these two words mean and make a model or picture of examples.

Laboratory Investigations

Laboratory Activity In Using Wood As A Fuel

A. **Introduction:** This activity allows the student to predict the energy value of burning certain kinds of wood. This activity should be conducted stressing that wood as a fuel is not an answer to the energy problem; but that wood can be a limited alternative to solve personal energy needs.

B. **Objective:** To provide a hands-on experience for students to determine the energy value of certain kinds of wood that can be used as a fuel for home heating.

C. **The Activity:**

1. Each student or student group will be supplied with one pound (454 gr.) samples (as shavings - size to be determined, but uniform) of the available Florida wood species. (Example: oak, cypress, pine, etc.)
2. The student or student group will then burn the shavings in a prepared stove (see Illustration "A") noting the maximum rise in temperature of one pound (454 cc) of water (see Illustration "B" for specifics.)
3. Through mathematical computations the student or student group can then calculate (in B.T.U.'s) the energy equivalent of one cord of the different wood species.
4. Computation of B.T.U. equivalent of a cord (8' x 8' x 8') of wood.
    - a. Prior to the activity the cubic measurements of the test sample (as cc) should be determined by compacting the sample into an approximate cube and measuring with a standard metric rule.
    - b. The cord measurements 8' x 8' x 8' must be converted into cubic measurements (as cc).
    - c. Divide the cc of the test sample into the cc of the cord to find the pound (gr.) equivalences.
    - d. Multiply the B.T.U. p/454 gr. (lb) times the pound (gr.) equivalence per cord to arrive at the approximate B.T.U.'s of a cord quantity of the different wood species.

D. **Questions for Thought and Research:**

1. What factors affect the availability and economics of using wood as fuel? Do these factors vary by kinds of wood?

2. What procedures would insure a constant and continued source of preferred tree species?

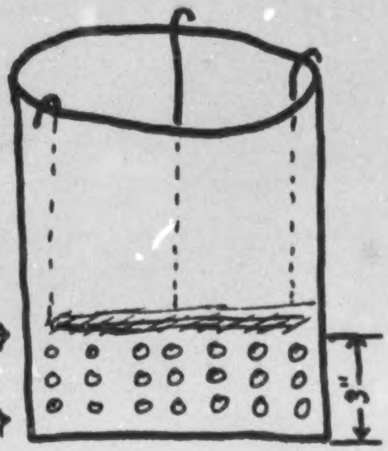
3. What are the proper methods for gathering, cutting, curing, and storing wood?

4. What factors affect the design, construction, and maintenance of wood burning stoves and fireplaces?

Illustration "A"

Stove construction for activity

Materials: #10 cans
1/2" Hardware cloth (mesh)
Coat hangers (wire)



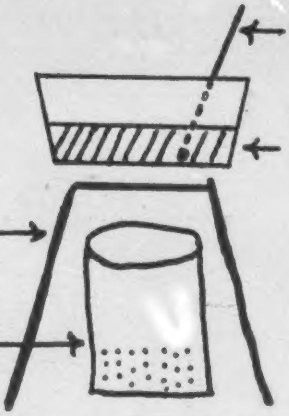
Use length of wire hangers to suspend mesh.

1/2" Hardware mesh cut and suspended in #10 can.

Punch holes in lower portion of #10 cans as a source of O_2 for proper combustion.

Illustration "B"

Procedures for Activity


Thermometer
Waterbath with 454 gr. or (454cc) of water
Tripod Stand
Wood Stove

1. Students set up apparatus as illustrated.
2. Note and record initial water temperature and time.
3. Start wood sample burning with 10ml. of charcoal lighter.
4. Watch thermometer rise during fuel burning.
5. Note and record the maximum H_2O temperature and time of burn to reach maximum temperature.
6. Compute the B.T.U. of the wood sample.

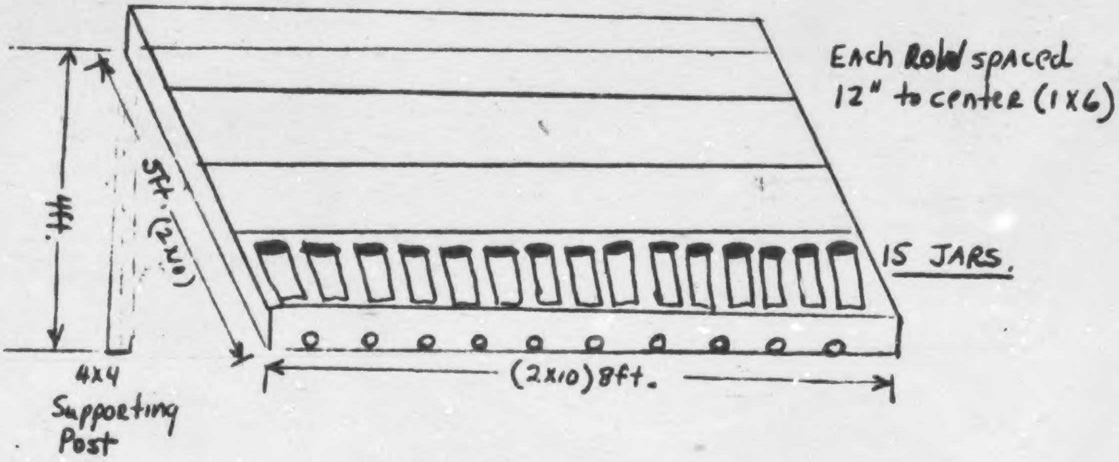
BUILD A SOLAR BIOGENERATOR

In an energy and food short world, solar energy is the most widely distributed energy source. Photosynthesis presently converts four to six percent of solar energy into biomass. If plant production of biomass could be doubled by better solar collection and absorption, the existing energy and food shortages could be eliminated. The solar biogenerator is an approach to solving this problem now and in the future.

Educational objective: Each student is to acquire knowledge of photosynthesis as a gathering of sunlight (energy) plus water and nutrients resulting in biomass or an increase in plant volume/weight. Further the student is to learn the possible uses of the produced biomass for food and energy and the increased solar absorption with use of the solar biogenerator.

Solar Biogenerator: Uses sunlight with greater effect by using the solar greenhouse effect coupled with a fast growing water plant. By increasing the duration and intensity of sunlight, each jar of pond water will produce algae and other water plants at increased rates, thus producing greater amounts of biomass. The activity will include each student bringing used mayonnaise jars (quart size) filled with pond or drainage ditch water (sanitation stressed) to school.

Construction of Solar Biogenerator: The solar biogenerator is a rack of 75 one quart used mayonnaise jars in five rows of fifteen jars. The rack should be made of a rectangular frame of 2 x 10 pressure treated lumber and slatted with four 1 x 6 pressure treated boards forming the five compartments for each row of 15 jars. The bottom of the rack should be constructed of 1/2 in. exterior plywood, and the bottom of the frame should have ten 3/4 in. holes for drainage. All measurements are as shown. The solar biogenerator weighs about 300 lbs. when loaded and is supported by three 4 x 4 posts angled 45° for Florida and the entire rack faces south. The entire rack is painted in glossy white enamel paint.



Student Activities:

Each student will bring one mayonnaise jar filled with local pond water to school on the same day.

Each student will take the jar lid and put five nail holes in a circle on the lid. After securing the lid on the jar of pond water each student will label their jar with name and date with masking tape and place the label on the bottom of the jar. The jar is then placed in a specified row for that class in the solar biogenerator. Each row will have 15 jars.

Each student will record daily for fifteen days the progress of growth in their jars. The color of the water should be recorded as: clear, brown, yellow brown, yellow, yellow green, light green, middle green and dark green. (some jars may dry leaving their biomass recorded as dried).

Each student will record at the end of 15 days the weight of their produced biomass by: emptying each jar on dry newspaper to dry the algae. Each student will then weigh the dried algae on a gram weight scale and record in record book.

The following questions will be answered at the end of the activity:

1. What is biomass? How is it formed from pond water?
2. How much biomass did your quart jar produce? Compare it to your friend's jar - were there differences? If so, can you explain why?
3. Do you think the solar biogenerator could solve an energy problem? If so how? (You may ask your teacher to burn your biomass, does this produce heat energy? So could this be used as fuel for an electric power company?
4. Take your biomass home to your pet fish, can this act as a food source?

Teacher Notes: You may wish to continue production. If so, rotate your jars on the fifteen day cycle returning some biomass from the end jars to the newly filled jars, emptying the last bottle and sliding each bottle to the right. You may also notice after five days some jars doing better than others. Isolate that strain of algae and pond water and fill beginning jars with the strain. Other activities you may want to use with your solar biogenerator.

-use the biomass for the production of methanol by yeast fermentation and distillation
-use the biomass as algae cakes or cookies (check health department)
-raise or lower solar biogenerator and check output of biomass
-experiment with various species of water plants for increased output
-sell your biomass as fish food to a local aquarium dealer under the label SBG "grown in the SUN with solar biogenerator."

IV. HOME ECONOMICS UNITS

ENERGY AND HOME CONSTRUCTION

To provide the necessary tools to work with students in the area of energy and home construction. Given a teacher fact sheet, hints for an energy efficient home, and two sample mini-activities, the teacher will be able to lead students to construct an energy efficient home model.

TEACHER FACT SHEET

1. Objects radiate heat; heat travels from an object into the air.
2. Objects which reflect radiant energy absorb little or no energy and minimize temperature increases.
3. Heat tends to move from an area that is warm into an area that is cooler.
4. Hot air rises while cold air sinks.
5. "Dead air" spaces reduce heat transfer.
6. Dark colored surfaces absorb solar radiation (increasing temperature) while light colored surfaces tend to reflect radiant energy.
7. Height and the angle of the sun affect the amount of incidence radiation and therefore temperature.

Hints for an Energy-Efficient Home

Design objectives for the Energy House are:

1. To reduce penetration of solar radiation during the summer.
2. To remove inside heat from people, lights, etc.
3. To improve evaporative cooling conditions by natural ventilation.

WINDOWS

*An energy efficient ratio for window area is no more than 10% of the floor area.
*In warm climates, put the largest number of windows in the south walls.
*Proper placement of windows allows for cross-ventilation in the warmest months of the year while screens and blinds can be used to reduce heat from solar radiation. Thermal drapes can be used to keep out cold in the winter months.
*Install windows you can open for natural ventilation in moderate weather.
*Louvered, or jalousie, window openings direct air into living areas.
*Combination screen and storm windows could reduce fuel cost by 15%.
*Caulk and weatherstrip doors and windows.
*Deflect daytime sun with vertical louvers or awnings on windows, or draw drapes and shades in sunny windows. Open shades in cold weather, close at night.
*Use double-pane window glass.

FOUNDATION AND FLOORING

*In cold climate if the base of a house is exposed build a "skirt" around it.
*In hot climates elevated floor allows air circulation for cooling.
*Carpet insulates floors as well as providing a noise cushion.

VENTILATION

*Vents and exhaust fans pull heat and moisture directly to the outside.
*Wind turbines effectively reduce attic and roof heat.

INSULATION

*Insulate hot water storage tank and piping.
*Insulate walls and roofs to a minimum of 6 inches in the attic and 3 inches in the walls.
*Insulate floors, especially those over cold basements and garage.

FIREPLACE AND WOODSTOVE

*Close fireplace damper when not in use, otherwise room air goes wastefully up chimney.
*Construct a vent or grille under the floor immediately in front of the fireplace to feed air to the fireplace.
*A fireplace heater captures more of the first heat before it escapes through the flue. This pipe-formed air heater works by sucking cold air from the floor.
*Adding a small wood stove can be a low cost way of heating. Cover the floor under the stove with asbestos sheet, and place tin or aluminum on top of the asbestos to reflect heat up and keep the floor cooler.

ROOF

*A ventilated roof removes heat by cross-ventilation.
*A light colored roof reflects solar radiation.
*A wide roof overhang shades walls, especially on east and west sides.

LANDSCAPE

*Grass reduces reflected heat and air.
*Trees with high branching will shade a structure and allow breeze to penetrate.
*Deciduous trees and vines on south and west sides of homes provide protective shade against summer sun.
*Shrubbery and plantings can provide for a pleasant view, ventilation, screening, windbreaks and protection against late afternoon summer sun.

MINI-ACTIVITIES

I. Mini-activity to demonstrate several of the principles concerning absorption and the radiation of energy as stated in the fact sheet:

Materials: (Per student or group of students)
3 cans filled with water
  (1 can painted black)
  (1 can covered with aluminum foil - shiny side out)
  (1 can painted white)
1 100-watt light bulb
3 thermometers

Procedure:
1. Place all three cans of water equal distances from the light source.
2. Record the beginning temperature of the water in each can. (hint - the water temperature should be taken near the center of the container.)
3. Turn on the light source and record the temperature of the water in each container at 3-minute intervals for half an hour.
4. Turn off the light source and record the temperature of water in each container at 3-minute intervals for half an hour.
5. Now plot the readings of temperature versus time elapsed - on a graph for each of the three containers. Plot the temperature on a vertical scale and the time on the horizontal scale. Put the date for all three containers on the same graph.

II. Mini-activity to illustrate the principle that warm air rises:

Materials: (Per student)
Thermometers
Meter sticks or rulers

Procedure:

1. Place students at various locations in the room. Each student is to remain at this location throughout the investigation.
2. Distribute the thermometers to the students.
3. At a specified time each student should record the temperature of the air at his location 20 centimeters above the floor.
4. At another specified time each student should record the temperature of the air in his location 1 meter above the floor.
5. At a final specified time each student should record the temperature of the air in his location 20 centimeters from the ceiling.
6. Now each students should plot the temperature readings versus height in the room on a graph.

Additional-mini activities may be developed by the teacher on the following topics which may help illustrate the principles involved in constructing an energy efficient home model.

1. Insulation
2. Landscape effects
3. Heat transfer by conduction
4. Ventilation

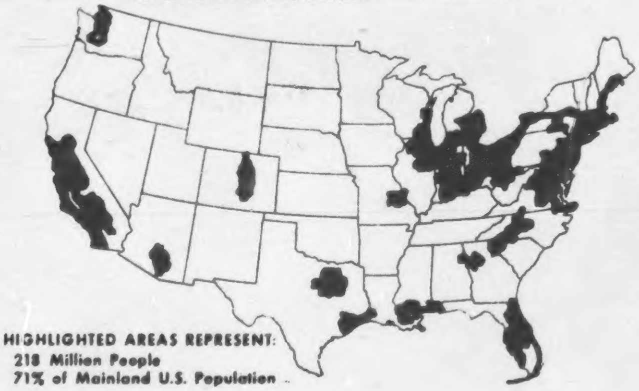
CONSTRUCTING THE MODEL HOME

Allow students to design and then to construct an energy efficient home model (either in groups or individually) using the concepts achieved from the mini-activities and concepts learned. Upon completion of the activity, have the students present their models to the class and explain the concepts used. Suggested materials for model construction:

plywood
sticks
straw
styrofoam
cardboard
popsicle sticks
cotton

tape
glue
straight pins
tacks
plexiglass
clorox bottles
saran wrap

reindeer moss
fabric
carpet and tile samples
paint
milk and egg cartons
construction paper
aluminum foil



12 Major Urban Regions Projected by Year 2000.

ENERGY CONSERVATION THROUGH HOUSING STYLES

Introduction: American lifestyles requires enormous amounts of energy. Some of this energy is tied up in the structure of homes in ways that have very little direct bearing on the standard of living.

As the world's finite supplies of oil and gas are exhausted, energy consumption has recently become an important consideration for residential homes. Therefore, it is important for students to develop an awareness of energy efficient or inefficient housing styles or features.

Objectives: 1. The student will identify factors that reflect how housing styles or features affect energy conservation. 2. The student will suggest at least five ways to improve energy conservation.

Prior to this activity, the students will take a field trip to survey the exterior of at least two homes located near the school. They will list what they consider energy efficient or inefficient housing styles or features. Back in the classroom, the students will compare, contrast, and make recommendations for their findings.

Learning activities: 1. Each student will be given two pictures of homes that are typical of their local communities and a checklist of factors that affect the conservation of energy as they relate to housing styles. The students will indicate a knowledge of these factors by placing a ______ by the energy efficient features and an ______ by the energy inefficient features. 2. The student will suggest at least five ways to improve energy conservation for each home. (These suggestions may be written or oral responses).

Checklist

Directions: Place a __✓__ by the features you consider energy efficient
and an __O__ by the features you consider energy inefficient.

1. External Landscaping
______a. shrubs
______b. trees
______c. grass
______d, other

2. External Glass Areas
______a. jalousied
______b. patio door
______c. aluminum framed colonial windows
______d. other

3. External Colors
______a. roof
______b. walls

4. Roof Type
______a. tin
______b. wooden shingles
______c. asphalt shingles
______d. other

5. Exterior Doors
______a. type
______b. number
______c. location

6. Roof Ventilation
______a. yes
______b. no

7. Shading Devices
______a. shutters
______b. overhang

8. Foundation
______a. elevated
______b. concrete

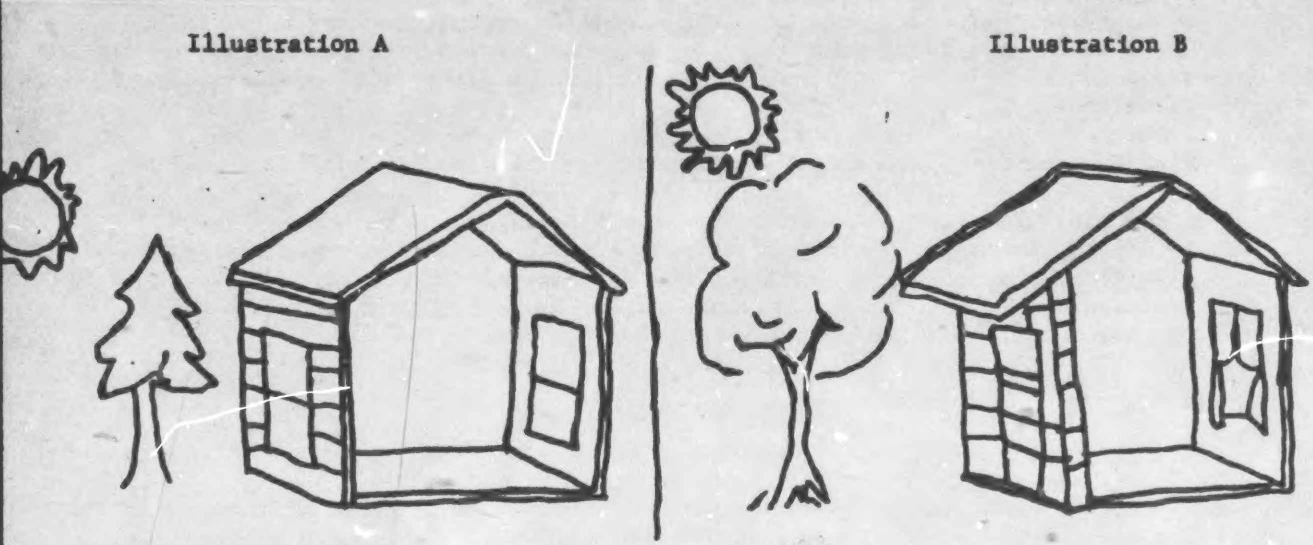
9. Wind Controls
______a. trees
______b. other vegetation

LIVING UNDER THE SUN

Generalization: Housing design can greatly reduce or eliminate the amount of energy needed by mechanical devices.

Objective: To identify basic concepts in using direct sunlight, wind, and vegetation to heat or cool homes.

Living Under The Sun



Find seven differences on the picture above. List these differences on the lines below:

______________________________ ______________________________

______________________________ ______________________________

______________________________ ______________________________

______________________________ ______________________________

Answers To Picture Find:

1. Sun's position
2. Length of overhang
3. Size of window
4. Treatment of window
5. Material used in exterior wall
6. Size of house
7. Kind of tree

Lesson 9. - Ways To Use Wind And Vegetation To Save Energy

Introduction: This unit discusses ways to reduce energy used for cooling. The methods require very little money and only a small amount of work. You can use things that are readily available (such as trees, curtains and a few other things which are easy to obtain).

Climate And Shelter Considerations

I. Shading Vegetation

Trees and vegetation can be used to provide shade where they will be seasonally beneficial. For example, deciduous trees (trees with leaves) are especially effective because they provide shade during the months and by shedding their leaves in winter do not interfere with useful solar radiation.

II. Wind Control For Ventilation

Trees and vegetation can be used to direct beneficial air into buildings. Be careful to avoid locating trees and vegetation where they might eliminate desirable cooling breezes during warm weather. Trees with high branches are good to shade structures and allow air movement. Grass helps to reduce reflected heat and glare.

III. Wind Control By Insulation

A. Caulking: Check all the outside doors of your home to see if there are cracks where the door frame meets the wall. Look along the edges of the frame, both inside and outside the house. For only a few dollars, you can get a caulking gun and a tube of caulking at a hardware store. Fill cracks with caulking on both sides of the door. Do the same for window frames.

B. Weather Stripping: There are various kinds of weather stripping you can use to seal the cracks around windows and around the top and sides of doors. There are other insulating devices that attach to the bottom of a door (called "door bottom" or "sweep") or to the threshold below the door. Some of these also keep out dust, light, noise and moisture as well as hot and cold drafts.

Some types of weather stripping come with adhesive backing; you just peel the paper from the back and stick the strip to the door or window frame to fill the cracks. Other types should be installed with small nails.

Weather stripping is not expensive but it is effective and it quickly pays for itself in fuel savings.

C. Storm Windows: If your house doesn't have storm windows, an inexpensive substitute would be to tape a sheet of clear plastic to the inside of all window frames. This will provide an efficient barrier against the cold, and for about $7, you will reduce your fuel costs by about 15 percent and make your home more comfortable.

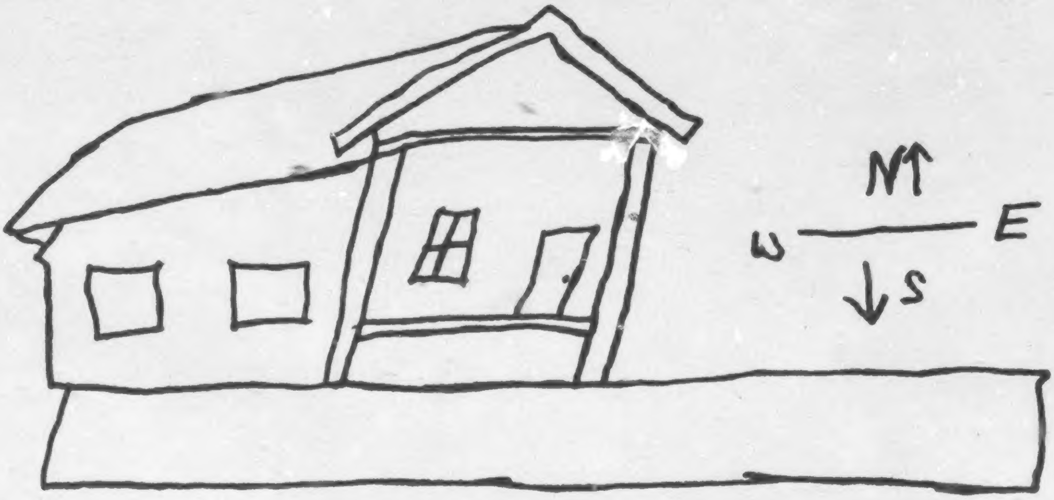
D. **Sealing Foundations And Floors:** Many older houses develop air leaks through the floor. These cracks allow heat to escape and cold air to enter. Houses on poles and those with stone foundations let the wind blow underneath the floor. Here are some things you can do to keep Old Man Winter out:

Cover your floors with rugs. If you don't have rugs they can be brought at garage sales and auctions. Before you lay the rug down, cover the floor with several layers of newspaper and then tack down the rug.

If the foundation around the house is open or has a space where the wind can get in, close it off. Fill old sacks with dirt or leaves and stuff these around the edge of the house to fill the space between the frame and the ground. Another way is to nail tar-paper or plastic to the frame and drape it to the ground. It can be held in place with rocks, bricks, or dirt.

Learning Objective: After discussing the content of Lesson #2, the students will be able to complete the following activity to reinforce the learning.

Activity: Make the illustrated house more energy efficient by answering the following questions.

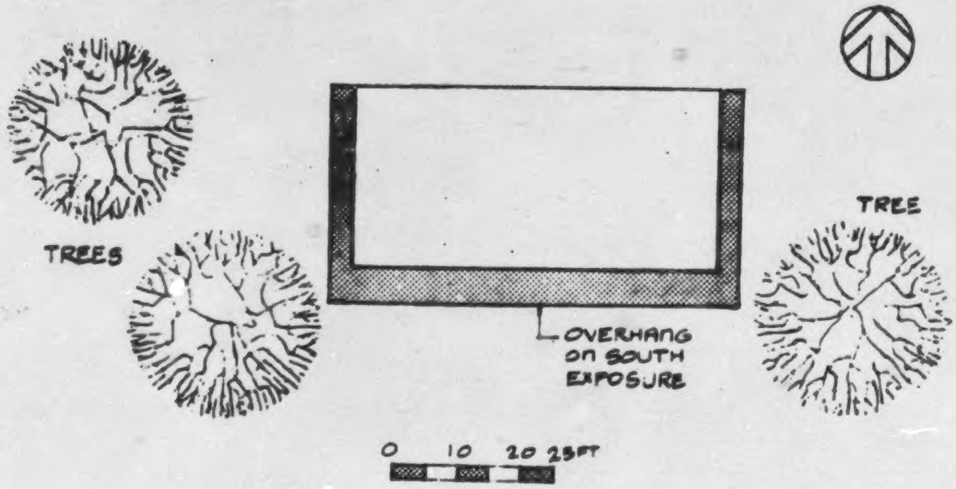


1. Where should shade trees be planted and why?
2. What type of trees should be used and why?
3. Should there be grass planted? If so for what purpose?
4. If curtains or shades are used for shading purposes, when should they be opened and closed?
5. What can be done to eliminate cracks around outside doors?
6. What is another type of insulating device used around both windows and doors?
7. What is an inexpensive way to insulate your windows if you don't have storm windows?
8. What are some ways to keep the air underneath your house from blowing in?

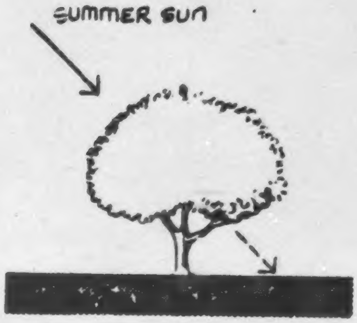
Related Activities:

1. Compare two plans clipped from magazines or placed on transparencies for energy efficiency.
2. Design and build a model home of balsawood on cardboard.
3. Visit homes in the community and evaluate their designs from an energy efficiency standpoint.
4. Compare your home's energy use with the home of a friend. Account for any differences due to design. (Note: introduce other factors which influence energy use, that is; lifestyle, size of family).

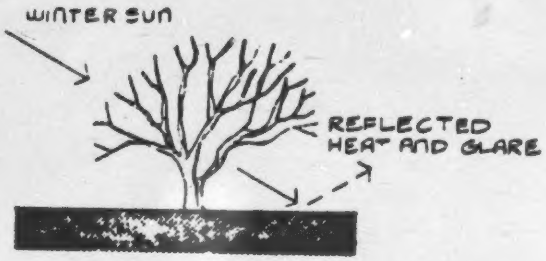
Typical Building Shading Layout


TREES
TREE
OVERHANG ON SOUTH EXPOSURE
0
10
20
25FT

Summer (Overheated Period)



Winter (Underheated Period)


WINTER SUN
REFLECTED HEAT AND GLARE

Study Questions:

1. Which illustration represents the sun's position in summer? (Illustration B). The sun is at a higher angle during summer than in winter.
2. On which side of the house would an overhang be most effective? (South side). An overhang should not be less than 2 feet. This blocks the sun's rays in summer and permits entrance of the sun's ray during the winter. On the east and west, where the sun's rays are lowest, wider shading devices are more effective. (like awnings and porches)
3. On which side of the house would you put windows to achieve heat gain from the sun? (South and West). In winter, windows on the south can effectively heat parts of the home. How does the size and number of windows affect heat gain? Heat loss? A recommended energy - efficient ratio for windows is no more than 10% of the floor area.
4. How can the curtains in Illustration B reduce heat loss in winter? (They can be opened when sun is shining and closed at night). Sunny windows must be closed off at night to reduce heat loss through the glass. Draperies, shutters and insulated wood panels help reduce heat loss. How can curtains help cool a house in summer? (They can be closed to block the sun).
5. In which illustration would you expect the interior of the house to become heated more quickly? (Illustration A). With the use of uninsulated wood walls, heat is quickly transferred to the interior. Concrete block absorbs heat and is slower in transferring it to the interior. Heat is retained inside after the sun goes down, making the interior warmer at night.
6. Why is it easier to retain heat in a smaller house? (There is less area exposed). The smaller the exterior surface the less the loss is through walls, windows, and cracks.
7. In which illustration will the tree block heat from the sun in summer? (Illustration B). In which will the tree allow heat from the sun to enter the house in winter? (Illustration B). Deciduous trees on the south and west provide shade from the sun in summer; their loss of leaves allows use of the sun's energy for heat in winter.
8. What is another way in which the sun can be used effectively in cooling or heating a home?

Suggested Concepts: Reflective exterior surfaces, that is; white, aluminum will provide a cooler house.

Take down screens in winter to allow sun in; put up in summer to help block the sun.

Rectangular shapes within a range of 1:1.7 to 1:3 proportions and elongated on an east-west axis minimizes effects of the sun in a hot-humid climate.

SAVING ENERGY AND WATER

Activities

1. List all the appliances and fixtures in your home that require water.
2. Make a list of the ways you can save water for each item on your list.
3. Past the amount of water your family used in one day and in one week. Compare this with other members of your class.
4. Find out the average cost of water per gallon from your local water company.
5. Total up how much water is used by the families in your class.

WATER INFORMATION

Use this table to determine useage of water per person per time.

Clothes washer	32 gallons
Cooking a meal	5 gallons
Washing dishes	8 gallons
Brushing teeth	1/4 gallon
Drinking	1/4 gallon
Washing face or hands	2 gallons
Flushing a toilet	3 gallons
Taking a shower	20 gallons
Taking a bath	30 gallons

Saving water is a family project. One of the largest areas of water waste is the bathroom. We use four times as much water in our homes now as in 1900.

Saving Hints

*Adjust the float in toilet tank so the toilet uses less water.
*Check the faucets in the tub and sink for leakage.
*Don't leave water running when you brush your teeth or wash your face.
*Appliances like dishwaters and washing machines should be run with full loads.
*Add a brick to the toilet tank takes up space and saves water.

Water
Conservation
at Home...
A Must!

The Conservation of Energy by Recycling Throw-Away Clothes and Household Items

Introduction

Many people living in the United States today have a very high standard of living; higher in fact, than in any other country. Therefore, if we want to maintain these high standards, we as future homemakers must become couscious of the urgent need to use our energy resources wisely for two main reasons:

1. There are more people using energy now than in former years.
2. Each person has many more energy machines and appliances to work for him now.

Objectives

There are four major objectives to be achieved through student involvement in this unit.

1. The student will discover basic information and will understand concepts about energy conservation.
2. The student will be able to identify major energy problems as well as be able to work on ways of solving some of the energy problems.
3. The student will demonstrate personal commitment by taking actions that will aid or prevent some of the energy problems.
4. The student will have an opportunity to take field trips and visit exhibits on energy conservation.

Basic Concepts

*American families use far more energy than they can produce.
*All earth energies originate with the sun.
*Energy is used as a life substance.
*Consumers can help save energy.

Activities

The students will select a household item from home such as a blanket or quilt and see how many smaller useful items can be made from same, such as: napkins, dish towels, pocket books and hot food pads. The student will select a personal item from his clothing closet and secure directions for making any one or more of the following items:

Items from Closet or Home:	What to Make
A long pair of jeans	shorts
	hats
	pocket books
	scarf
	tote bag
Discarded blanket or quilt	shawl
	hot pads
	jackets
	pocket books

FREE LEAFLET
FOR STUDENTS

make it a SHOULDER BAG

[illegible] bag makes it for any occasion, any season. Make it in any fabric . . . [illegible] corduroy, [illegible] [illegible] [illegible]—in a fake fur and leather-[illegible] [illegible] [illegible] [illegible] personal touch, you may [illegible] [illegible] or rick rack trim.

[illegible] for [illegible] techniques. [illegible] fabrics.

MATERIALS

Bag fabric—for complete bag [illegible]
(36" wide)
For bag body, strap and [illegible]
For flap of alternate fabric, [illegible] piece 12" [illegible]

J. & P. COATS DUAL DUTY PLUS [illegible]

Interlining—polyester fleece, ⅜ [illegible] 24"

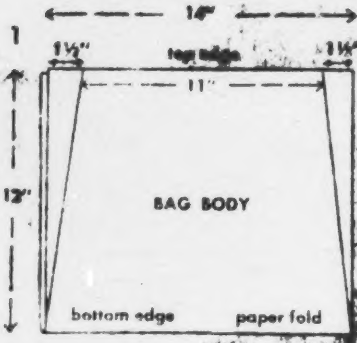
Lining fabric—⅜ yd. or 1 piece [illegible]

2 metal rings about 1½" in di[illegible]

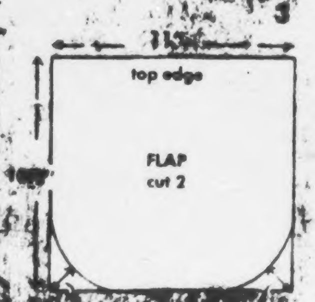
Paper for pattern • Cardboard [illegible]—optional

MAKING THE PATTERN—Make [illegible] paper pattern for BODY, LINING and FLAP. For BODY, cut a piece of paper 24" x 14". Fold in half crosswise and mark in 1½" from cut edges (1). Draw a straight line from fold line to mark; cut along line. Open out pattern. For LINING, trace same size and shape as folded BODY pattern and add ⅝" seam allowance to bottom edge (2). For FLAP, cut a piece 11" x 10½", rounding off corners (3).

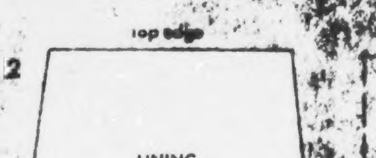
1


14"
1½"
top edge
1½"
11"
12"
BAG BODY
bottom edge
paper fold

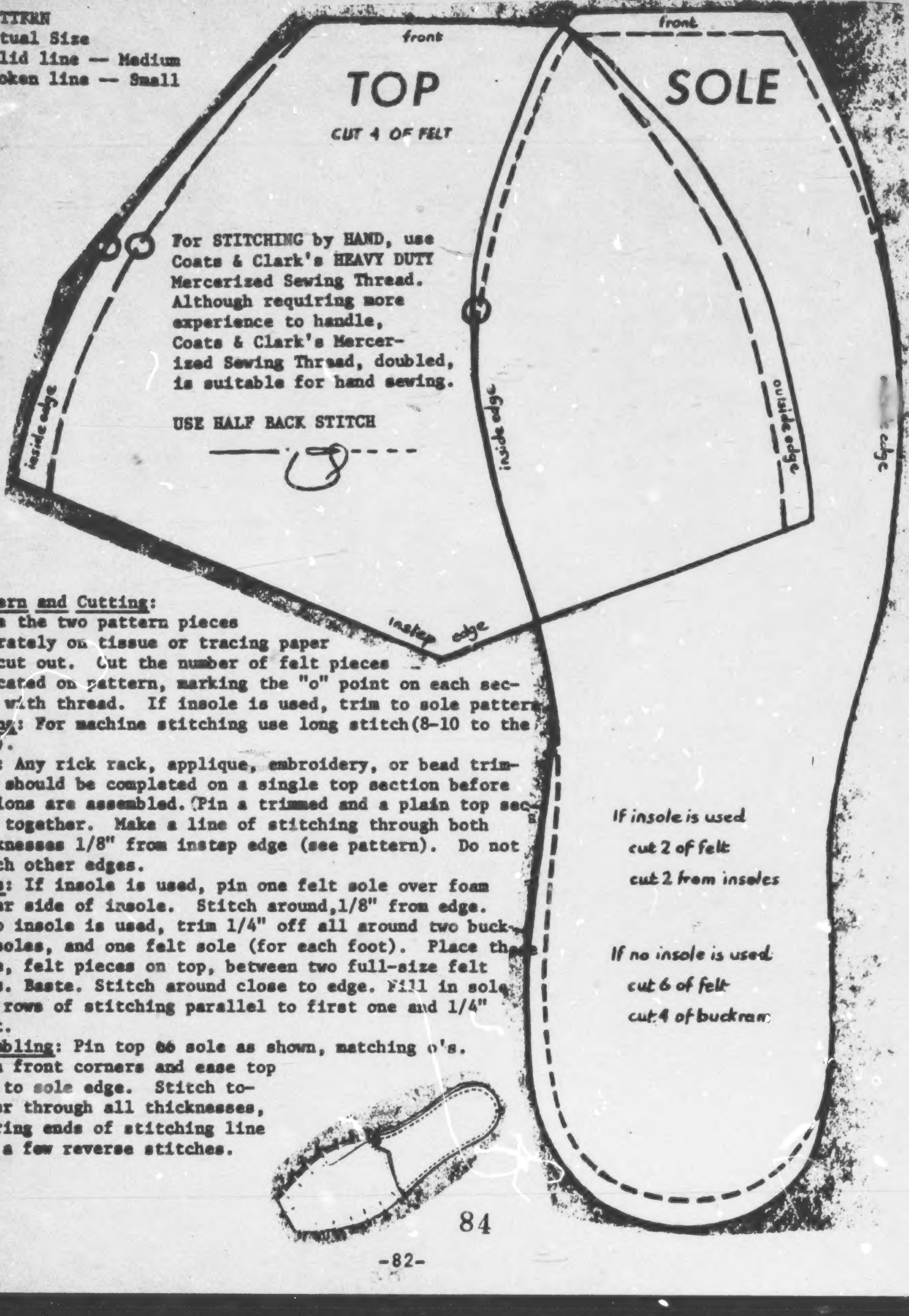
3


11½"
top edge
10½"
FLAP
cut 2

2


top edge
LINING
cut 2
bottom edge
⅝"

PATTERN
Actual Size
Solid line -- Medium
Broken line -- Small


front
TOP
CUT 4 OF FELT
inside edge
instep edge
front
SOLE
inside edge
outside edge
edge
If insole is used
cut 2 of felt
cut 2 from insoles
If no insole is used
cut 6 of felt
cut 4 of buckram

For STITCHING by HAND, use
Coats & Clark's HEAVY DUTY
Mercerized Sewing Thread.
Although requiring more
experience to handle,
Coats & Clark's Mercer-
ized Sewing Thread, doubled,
is suitable for hand sewing.

USE HALF BACK STITCH

attern and Cutting:
race the two pattern pieces
eparately on tissue or tracing paper
nd cut out. Cut the number of felt pieces
ndicated on pattern, marking the "o" point on each sec-
ion with thread. If insole is used, trim to sole patter
ewing: For machine stitching use long stitch(8-10 to the
nch).
ops: Any rick rack, applique, embroidery, or bead trim-
ing should be completed on a single top section before
ections are assembled. Pin a trimmed and a plain top sec
ion together. Make a line of stitching through both
hicknesses 1/8" from instep edge (see pattern). Do not
titch other edges.
oles: If insole is used, pin one felt sole over foam
ubber side of insole. Stitch around, 1/8" from edge.
f no insole is used, trim 1/4" off all around two buck-
m soles, and one felt sole (for each foot). Place the
hree, felt pieces on top, between two full-size felt
oles. Baste. Stitch around close to edge. Fill in sole
ith rows of stitching parallel to first one and 1/4"
part.
ssembling: Pin top ~~to~~ sole as shown, matching o's.
atch front corners and ease top
dge to sole edge. Stitch to-
ether through all thicknesses,
ecuring ends of stitching line
ith a few reverse stitches.

FOODS: Concept: To encourage students to utilize foods regardless of personal feelings because of energy input and energy waste.

Objective: To make students aware of food needs, food sources, and energy spent in the preparation of food.

AM I WASTEFUL WILLIE....OR FANTASTIC FILLY????

Menu Item	Group	Nutrient	Did I eat it?	Why didn't I eat it?	I would have eaten it if...	Who prepared it?	Who produced it?	Did I waste energy?	What energy was produced	What energy was wasted?
			1	2	3	4	5	6	7	8
Apple	Fruit	Carbohydrate	Yes	N/A	3 or 5	N/A	2	NO	1	NONE

1.
1 - yes
2 - no

2.
1 - too salty
2 - don't like it
3 - overcooked
4 - undercooked
5 - not hungry

3.
1 - fried
2 - boiled
3 - baked
4 - stewed
5 - raw

4.
1 - cafeteria
2 - parent
3 - myself
4 - manufacturer

5.
1 - dairyman
2 - farmer
3 - manufacturer
4 - baker
5 - self

6.
1 - yes
2 - no

7.
1 - human
2 - none

8.
1 - sun
2 - human
3 - gas
4 - wood
5 - electric
6 - other

Needs Vs. Wants In Home Energy Consumption

Objective: The student will distinguish between present and future household needs and wants which require energy consumption and offer alternatives to such consumption.

Developed for: Modern Family Living classes; Grades 10-12.

Suggested Preceding Activities: Developed lessons on the concepts of values, goals, needs, wants, and standards.

Developed lessons and discussion on the nature of the present and future energy crisis; what it is; what it means; personal responsibility for. The following vocabulary words should be covered: Energy, Consumption, Consumer, Efficiency, Fossil Fuels, Alternate Energy Sources (i.e., nuclear, solar, wind, water, steam), Conservation.

Introduction to the Lesson: You will, within the next few years, be setting up a household for yourself. With our nation's energy problems, you have a personal responsibility to conserve whenever and wherever possible. Think of yourself as being in the energy "efficiency-wise generation" and not comparing yourself to what your older brothers and sisters, friends, or even people today are doing. You're working toward your future— and there is no doubt that we'll all have to be more energy conscious.

Evaluate your present living standards and see if you could help conserve energy. For example, many of the common home appliances are not needs at all (we could easily get along without them) but represent our wants in terms of our current values.

In doing the following activities, consider your overall goals for: yourself, your future mate, your future family, your community, your nation! Make sure your energy decisions will be helpful for the future.

ACTIVITY - PART I

Directions: *Be sure the activity is done in the order listed.

A) Read over the list of energy-using conveniences commonly used in the home. According to your present life style and standards for today, indicate to the left, which items you need with an "N" and those you just want, but do not necessarily need with a "W".

B) Next, indicate the type energy needed to run the particular energy-user. G=gas, E=electricity, FO=fuel oil, W=wood, K=kerosene.

C) Make a general estimate as to the approximate number of hours per week this appliance is used.

D) Considering what you know about the availability of future fuels and your future life style, check those items you will purchase for your future household, either because you need and/or want them.

E) Suppose the government is forced to put restrictions on the energy used in the home because the citizens are not voluntarily doing their part. You may use only four electrical items, and one gas item, and unlimited wood-burning items. Check the items you will then choose to use.

HOME USE AND ENERGY CHECKLIST

Needs	Wants	Energy-using Item	Energy	Hrs/Wk	Voluntary	Govt. Restr.
		Dryer				
		Fan				
		Deepfreeze				
		Electric razor				
		Electric Blanket				
		Garbage Disposal				
		Electric water pump				
		Space heater				
		Oven				
		Electric coffee pot				
		Air-conditioner				
		Waffle Iron				

HOME USE AND ENERGY CHECKLIST

Needs	Wants	Energy-using Item	Energy	Hrs/Wk	Voluntary	Govt. Restr.
		Electric Radio				
		Electric can opener				
		Blender				
		Stove				
		Refrigerstor				
		Dishwasher				
		Mixer				
		Popcorn popper				
		Toaster				
		Broiler-oven (portable)				
		Electric skillet				
		Telephone				

HOME USE AND ENERGY CHECKLIST

Needs	Wants	Energy-using Item	Energy	Hrs/Wk	Voluntary	Govt. Restr.
		Lamps				
		Television				
		Electric toothbrush				
		Hair Dryer				
		Vacuum Cleaner				
		Furnace				
		Water Heater				
		Electric clock				
		Sewing Machine				
		Record player/Stereo				
		Iron				
		Washer				

HOME USE AND ENERGY CHECKLIST

Needs	Wants	Energy-using Item	Energy	Hrs/Wk	Voluntary	Govt. Restr.
		Humidifier				
		Doorbell				
		Electric saw				
		Electric knife				
		Electric typewriter/ or adding machine				
		Electric toys				
		Electric pencil sharpener				

ACTIVITY - PART II

Directions: Refer to the difference in the items you had to choose in the last column (Govt. Restr.) in Activity I chart compared to all of both your needs and wants in the first two columns. List those convenience appliances you now have to do without below on the chart. Tell what the appliance does for you, then suggest a way that you can accomplish the same task which the convenience item did, only now using no electricity, gas, or oil sources.

Appliance	What does it do?	How can you do it energy-wiser?

APPLIANCES

Cooking

	Average Monthly KWH Consumption
Range	100
Roaster (3 hrs/wk)	18
Deep Fat Fryer (1 hr/wk)	6
Broiler or Rotisserie ([illegible] hrs/wk)	12
Fry Pan (3 hrs/wk)	15
Toaster or Sandwich Grill	4
Coffee Maker (4 hrs/wk)	15

Refrigeration

	Average Monthly KWH Consumption
Refrigerator (12 cu. ft.)	64
Refrigerator-Freezer (12 cu. ft.)	119
Refigerator-Freezer (12 cu. ft. frost free)	173
Refrigerator-Freezer (15 cu. ft. frost free	196
Refrigerator-Freezer (18 cu. ft. frost free)	248
Refrigerator-Freezer (21 cu. ft. frost free)	264
Refrigerator-Freezer (24 cu. ft. frost free)	297
Refrigerator-Freezer (24 cu. ft. frost free — 3 doors)	346
Freezer (12 cu. ft.)	167
Freezer (16 cu. ft.)	178
Freezer (13 cu. ft. frost free)	190
Freezer (16 cu. ft. frost free)	243

Laundry Service

	Average Monthly KWH Consumption
Washer—Automatic (3 hrs/wk)	7
Washer—Conventional (3 hrs/wk)	6
Dryer (3 hrs/wk)	65
Iron (3 hrs/wk)	14

Water Heating

	Average Monthly KWH Consumption
Stand-By Usage	90
Family of Four	300
Add for each additional person	75
Add for each load of clothes washed	5

HEATING AND AIR CONDITIONING

	Average Monthly KWH Consumption
Heating Plant (Fuel oil, etc.)	28
Electric Portable Heaters (10 hours a day)	
550 watts	165
1350 watts	405
Electric Resistance Heating (5-month season)	
800 sq. ft. home	1024
1000 sq. ft. home	1280
1200 sq. ft. home	1536
1400 sq. ft. home	1792
1600 sq. ft. home	2048
1800 sq. ft. home	2304
2000 sq. ft. home	2560
Electric Heat Pump (12 months — heating and cooling)	
800 sq. ft. home	640
1000 sq. ft. home	800
1200 sq. ft. home	960
1400 sq. ft. home	1120
1600 sq. ft. home	1280
1800 sq. ft. home	1440
2000 sq. ft. home	1600

OTHER SERVICES

	Average Monthly KWH Consumption
TV — Color (28 hrs/wk)	40
TV — Black and White (28 hrs/wk)	30
Radio (20 hrs/wk)	7
Record Player-Radio (23 hrs/wk)	11
Dishwasher — With Heater Unit (5 hrs/wk)	25
Bed Covering — In Peak Season	20
Dehumidifier — In Peak Season	30
Incinerator	53
Water Pump (⅓ HP 10 hrs/wk)	15
Vacuum Cleaner (2 hrs/wk)	5
Clock Warmer Tray Toothbrush Waffle Iron Hair Dryer Food Mixer Heat Lamp Blender Heating Pad Waste Disposer Sewing Machine Floor Polisher Bottle Warmer Ice Cream Freezer Workshop Equipment — Each	2

Lighting

	Average Monthly KWH Consumption
4 to 5 Rooms	50
6 to 8 Rooms	60
9 to 12 Rooms	75

Ventilation—Fans

	Average Monthly KWH Consumption
Attic (15 hrs/wk)	32
Circulation (9 hrs/wk)	4
Ventilating (12 hrs/wk)	13

CENTRAL AIR CONDITIONING

APPROXIMATE KILOWATTHOURS USED DURING THESE MONTHS ARE BASED ON NORMAL OUTDOOR TEMPERATURE AND 80° INSIDE.

	April	May	June	July	Aug.	Sept.	Oct.
800 Square Feet	394	568	768	988	952	865	445
1000 Square Feet	493	710	960	1235	1190	1082	557
1200 Square Feet	591	852	1152	1482	1428	1298	668
1400 Square Feet	690	995	1344	1729	1667	1514	780
1600 Square Feet	788	1137	1536	1976	1905	1731	891
1800 Square Feet	877	1279	1728	2223	2143	1947	1002
2000 Square Feet	986	1421	1920	2470	2381	2163	1114

For other thermostat settings, increase above figures as follows:

79 Degrees	8%
78 Degrees	18%
77 Degrees	28%
76 Degrees	39%
75 Degrees	50%
74 Degrees	63%
73 Degrees	77%
72 Degrees	92%

ENERGY

Purpose:

This game has been developed as resource material for use by substitute teachers in middle schools or special education classes. It can be used in any class related to the study of the home but must be preceded by a discussion of what energy is and how it is used in the home.

Concepts:

1. There are many sources of energy used in the home.
2. There are ways to conserve energy.

Objectives:

1. For students to become more aware of energy terminology as related to the home.
2. Have the students become more aware of ways that they can conserve energy in their homes.

Materials Required:

1. 30 to 45 ENERGY game cards. Each card has the answers to the questions placed in different squares so that no two cards will read alike.
2. Twenty-four 3 x 5 inch file cards which contain the questions and answers.
3. Enough one-inch blank cardboard squares so that each student may have a sufficient amount to cover the necessary squares.

Directions:

This game is played like Bingo. It may be started by the teacher acting as leader and asking the questions She will read a question and the students will locate the answer on their cards and cover it with a piece of cardboard. The first student to cover five spaces in a straight line in any direction, wins and becomes the leader. The game continues in this manner for the desired length of time. The winner always becoming the new leader. Each leader should reshuffle the cards so that they will not be in the same order each time the game is played.

*Copy on 3x5 cards

A form of energy used in the home that arises from the existance and interactions of electric charge. ELECTRICITY

Certain materials that are placed in attics, walls, and under homes to prevent heat loss in winter and to keep homes cooler in summer. INSULATION

The placement of windows in a home to get the maximum amount of breezes from the outside. CROSS VENTILATION

The type of television that uses the greater amount of energy. COLOR

Uses more energy for washing dishes than the old-fashioned dishpan method. DISHWASHER

A form of energy that is derived from rivers, streams, etc. HYDRO

Energy produced by splitting atoms in a nuclear reactor. It has begun to be used in the production of electricity. NUCLEAR ENERGY

A crucial point when there must be a turning about in the use of energy. ENERGY CRISIS

A unit that measures the rate at which energy is produced or used. KILOWATT

A type of refrigerator that uses more energy than the manual type. FROST FREE

Anything that can be burned or fissioned to produced heat energy. FUEL

The preservation of energy from loss, waste, or harm. CONSERVATION

Energy received from the sun. SOLAR ENERGY

When doing the family laundry, one can save energy by using this. COLD WATER

An expensive user of energy that many families feel is necessary to get their clothes dry. CLOTHES DRYER

A form of energy used in the home that is derived from our forests. WOOD

An object in heaters and air conditioners that must be cleaned or changed regularly in order to save energy. FILTER

The ability to do work or to make things move. ENERGY

This should be set higher in the summer and lower in the winter to conserve energy. THERMOSTAT

A method of using electrical energy in cooling the home that uses less energy than an air-conditioner. FAN

The type of lighting fixtures that use less energy than the standard light bulbs. FLUORESCENT

Sapping the strength of our energy. WASTING ENERGY

Narrow strips of material placed over or in crevices, as at doors or windows, to exclude drafts, rain, etc. WEATHERSTRIPPING

(MAKE ONE FOR EACH STUDENT)

ENERGY

INSULATION	ENERGY CRISIS	KILOWATT	CROSS VENTILATION	LEAKY FAUCETS
COLOR	FROST FREE	CONSERVATION	FUEL	SOLAR ENERGY
COLD WATER	FILTER	FREE	CLOTHES DRYER	WOOD
ENERGY	THERMOSTAT	ELECTRICITY	WEATHER STRIPPING	WASTING ENERGY
FLUORESCENT	FAN	DISHWASHER	HYDRO	NUCLEAR ENERGY

Supplemental Activities

Wind Investigation

The purpose of this unit is to create an awareness of the wind as an energy source. The experiments and activities are designed to enable the student to understand the value of the wind as an energy source.

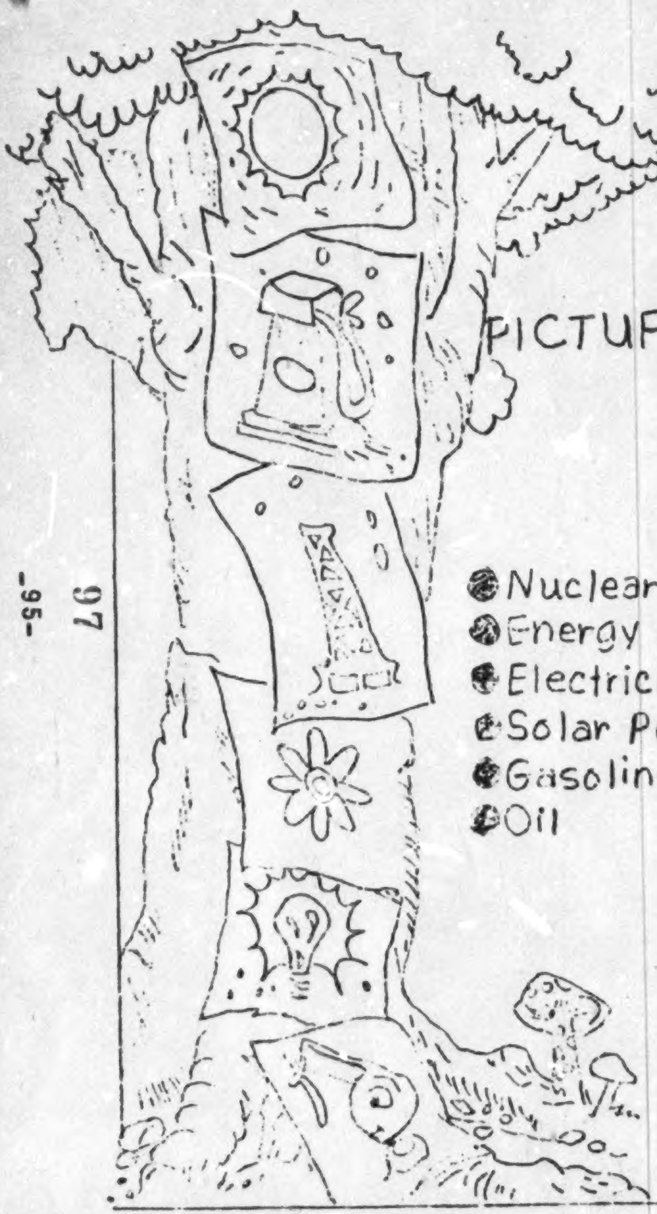
Objectives: To help the students:
a. Realize that one form of energy is the wind
b. Learn that energy can be changed from one form to another.
c. Learn that the wind is moving air and is an alternative energy source.

Learning Opportunities

1. Kite Flying
   Take the students outdoors on a windy day and fly a kite they have constructed. Try this again on a very still day. Talk about how the kite got off the ground or how the kite stayed on the ground. Send paper messages up to the kite on the string. What makes the messages move up the string?
2. The Search
   Go on a search indoors and out for the purpose of finding things that are being changed by the wind. Record your observations.
3. Sailboats
   Build sailboats using materials such as nutshells, bottlecaps, clay, toothpicks, paper sails and straws. Fill a tub with water and use the straw to blow the boats on the water. How do the boats move? If you blow harder on the sail will the boat move any faster.
4. Pinwheels
   Make pinwheels using paper, pencils and straight pins. Go outdoors and observe the pinwheels move or place the pinwheels in front of an indoor fan. How does the pinwheel work? What makes it move? What happens when we turn the fan off?
5. Windmills and Weathervanes
   Construct a small scale windmill as a class project. Visit a local barn and observe a weathervane. See a film about windmills.
6. The Arts
   Create a dance, verse for a song, poem or picture which illustrates how we could use the wind as an energy source. Try to catch the wind....use a parachute perhaps? Be your own wind.
7. Creative Play
   Seat the children in small circles consisting of 3-4 children. As a group have them try:
   -using their bodies to make something being changed by the wind.
   -being a windmill.
   -being a kite.
   -being a piece of paper 'floating on the wind'.
   -being a seagull flying high over the ocean with the wind under it's wings.
   -being the cold winter wind blowing through the cracks of your home.

Follow-Up Activities

During the entire unit have the students take black and white photographs of all the activities. These photos can be used to make a collage to tell about the wind and it's uses. Let the students dictate stories about their photos and their personal experiences.



MATCH
THE
PICTURES and WORDS

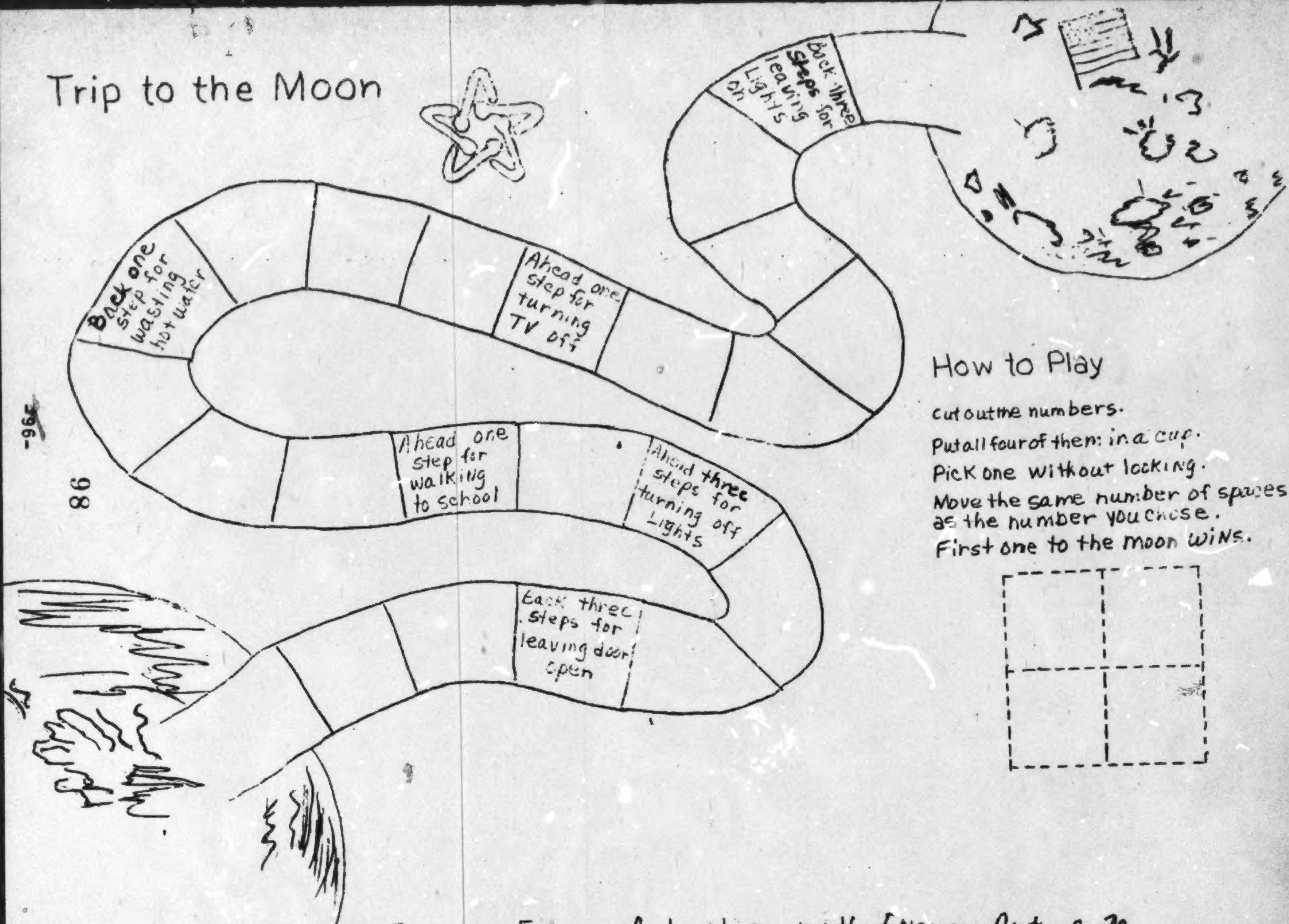
- ● Nuclear Power
- ● Energy Ant
- ● Electricity
- ● Solar Power
- ● Gasoline
- ● Oil

RIDDLES

1. How is energy conservation like a baseball team?
2. What did Energy Ant say to the light bulb?
3. What did the light bulb say to the light switch?
4. How much fuel does it take to fly around the world?

Source: Energy Activities with Energy Ant, p. 16.

Trip to the Moon


Back one step for wasting hot water
Ahead one step for turning TV off
Back three Steps for leaving Lights on
Ahead one step for walking to school
Ahead three steps for turning off Lights
Back three steps for leaving door open

How to Play

cut out the numbers.

Put all four of them in a cup.

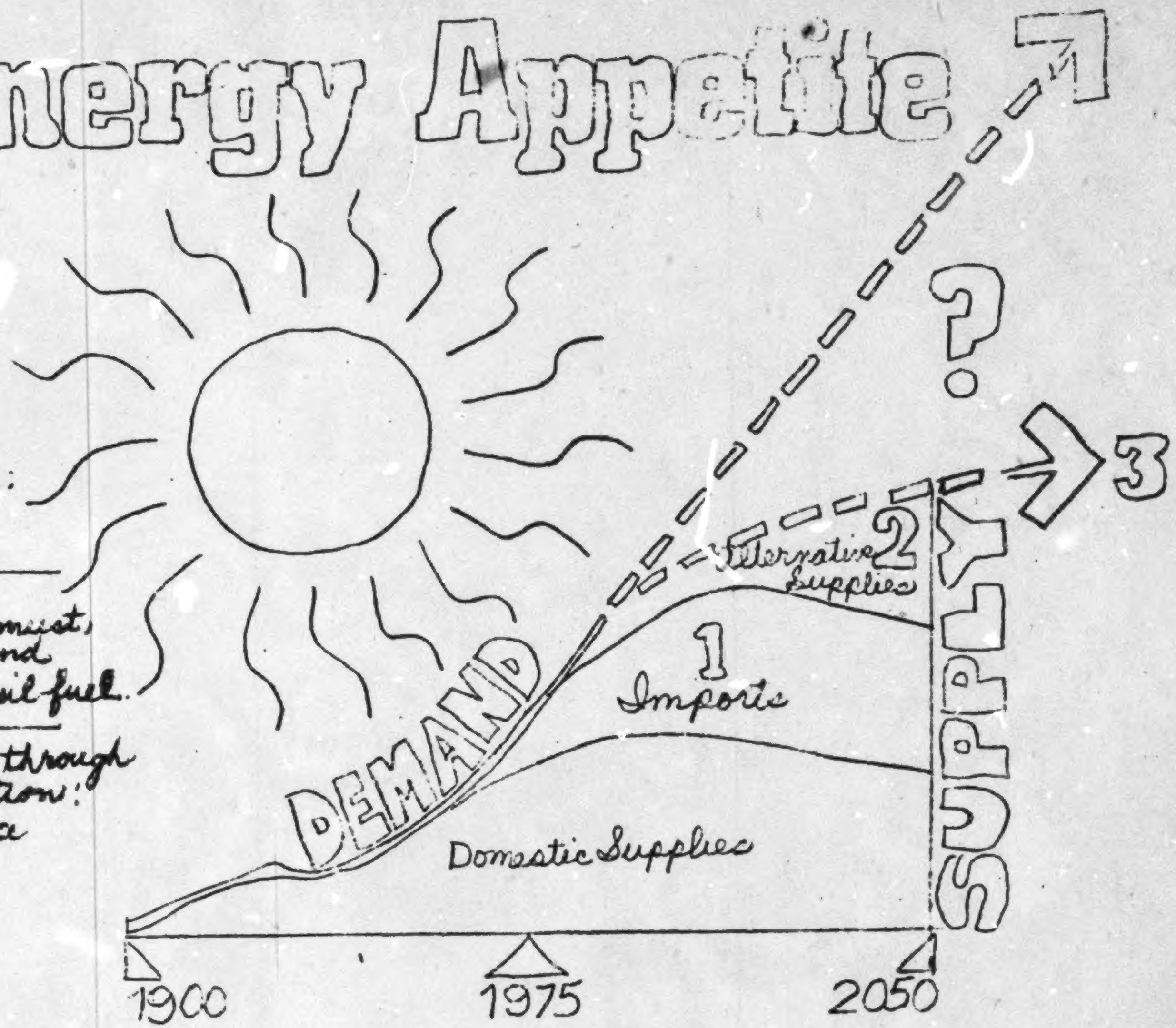
Pick one without looking.

Move the same number of spaces as the number you chose.

First one to the moon wins.

Source: Energy Activities with Energy Ant, p. 20.

Our Energy Appetite

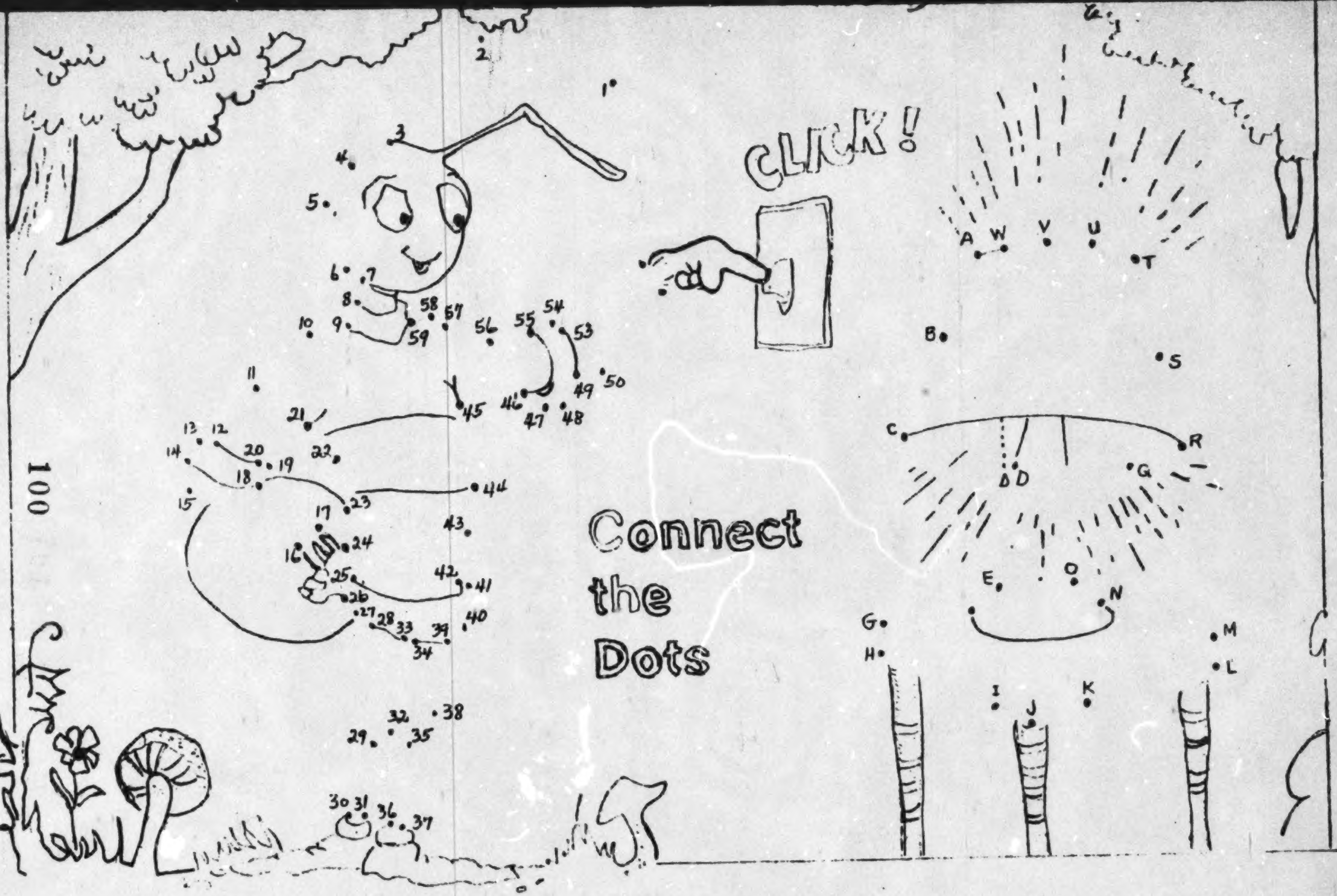


1 Importing more oil: is too costly and unreliable!

2 Developing supply alternatives: is a must, but is expensive, and takes time and fossil fuel.

3 Reducing demand through energy conservation: is the only choice available *how*.

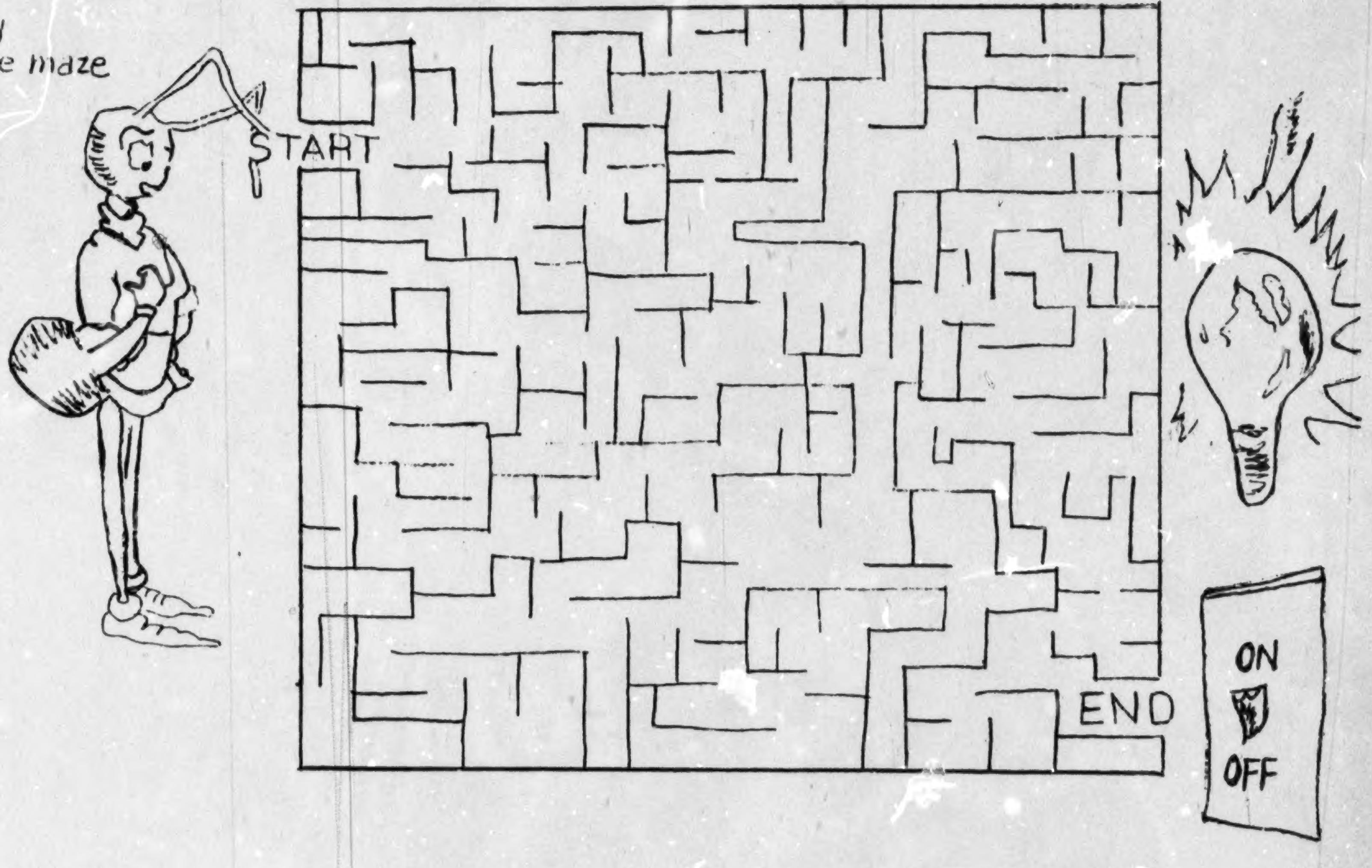
Source: Energy Activity Guide, p. 12.


CLICK!
Connect the Dots

Source: Energy Activities with Energy Ant, p. 14.

Help Energy Ant

Find a way
through the maze
to turn off
the light.

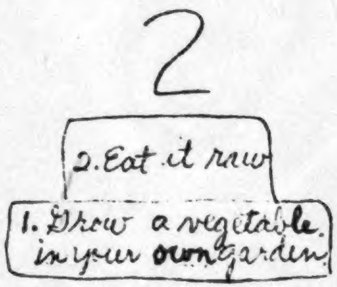

START
END
ON
OFF

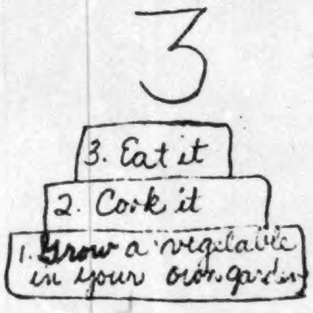
Source: Energy Activities with Energy Ant, p. 21.

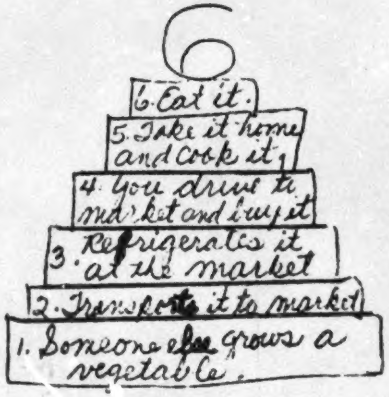
Stepping Off Energy

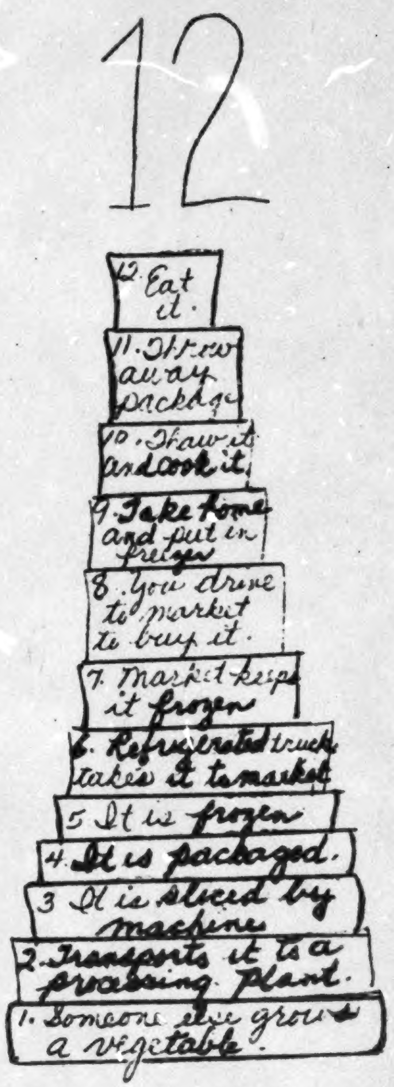
We can compare the different ways **people** use energy. Pyramids can be drawn to illustrate **how we** use **energy** in **our everyday** life.

Read this activity to help you see the **whole energy picture** of some of the things **you use.** Food **has been used as** an **example.**


2
2. Eat it raw
1. Grow a vegetable in your own garden


3
3. Eat it
2. Cook it
1. Grow a vegetable in your own garden


6
6. Eat it.
5. Take it home and cook it.
4. You drive to market and buy it
3. Refrigerates it at the market
2. Transports it to market
1. Someone else grows a vegetable.


12
12. Eat it.
11. Throw away package
10. Thaw it and cook it.
9. Take home and put in freezer
8. You drive to market to buy it.
7. Market keeps it frozen
6. Refrigerated truck takes it to market
5 It is frozen
4. It is packaged.
3 It is sliced by machine
2. Transports it to a processing plant.
1. Someone else grows a vegetable.

Source: Energy Activity Guide, p. 14.